THE

ANNUAL REPORT

OF THE

SUPERINTENDENT OF GOVERNMENT FARMS

(MADRAS PRESIDENCY),

FOR THE YEAR ENDING 31st OF MARCH 1875.

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THE ANNUAL REPORT OF THE SUPERINTENDENT OF GOVERNMENT FARMS, FOR THE YEAR ENDING 31ST OF MARCH 1875.

GENERAL.

SEASON, &c.

1. *Weather.*—The rainfall registered at the Sydapet Experimental Farm during the past year amounted to 68·98 inches, against 47·23 inches, the average annual fall of the previous ten years. The amount of rain that fell would have been quite sufficient for the requirements of agriculture, had it been more evenly distributed throughout the year, but it was chiefly precipitated in heavy showers at very irregular intervals; though the fall was much higher than the average annual fall, there were only fifty-nine wet days, against seventy-three, the average number of wet days in each year during the previous ten years; thus, on the average, there was 1·17 inches of rain registered for each day on which rain fell.

2. There was no rain whatever in April. There were three wet days in May, and during these three days the fall was 6·79 inches, giving an average of 2·26 inches for each wet day. In June the rainfall was 6·66 inches, which fell on seven days; the average fall on each day was ·95 inches. In July there were eight wet days, and the quantity of rain registered was 5·46 inches, giving ·68 inches as the fall for each day. During the next month the rainfall was much lighter, only 2·34 inches precipitated on five days, giving an average of ·47 inches for each day on which rain fell. September was an unusually wet month; there were twelve days on which rain fell, while the quantity collected was 10·59 inches, or more than double the average fall in this month, during the ten previous years. The total fall in October was 21·91 inches precipitated on ten days, an average of 2·19 inches per wet day; though the fall was so heavy, there was only one day previous to the 16th of the month on which rain fell, and there were only three wet days on which the quantity of rain registered was less than one inch, while on the 23rd, 24th, and 25th the total amount collected was no less than 13·94 inches. The rainfall registered in November was only about half the quantity usually registered in this month; there were seven wet days, and the fall amounted to 9·25 inches, or 1·32 inches per day. Rain fell only on five days in December, during which 5·11 inches were collected, giving an average of 1·02 inches for each day. During the remaining three months of the year the quantity of rain collected was only ·87 of an inch, which fell on two days.

3. The following table shows the amount of rain that was registered during each month of the year, and the number of days in each month on which rain fell, compared with the average monthly registrations of a similar kind for the preceding ten years:—

—	1874-75.		Average of the previous 10 years.	
	Inches.	Wet days.	Inches.	Wet days.
April	...	...	0·28	0·8
May	6·79	3	0·84	1·3
June	6·66	7	2·79	7·6
July	5·46	8	3 96	10·4
August	2·34	5	5·32	11·3
September	10·59	12	4·25	8·6
October	21·91	10	8 19	11·5
November	9·25	7	14·14	13·4
December	5·11	5	5·39	6 0
January	0·10	1	1·08	1·4
February	...	..	0·91	0·9
March	0·77	1	0·08	0·4
Total ...	68·98	59	47·23	73·6

4. The next statement exhibits the rainfall of the year made out in weekly totals.

——	1874-75.		Average of the previous 10 years.		——	1874-75.		Average of the previous 10 years.	
	Inches.	Wet days.	Inches.	Wet days		Inches.	Wet days.	Inches.	Wet days.
1st Week...	...	...	·22	·2	28th Week..	...	...	·80	1·7
2nd do. ...	...	...	·03	·2	29th do. ...	3·23	2	4·00	3·8
3rd do. ...	...	...	...	...	30th do. ...	17·53	7	1·22	2·8
4th do. ...	...	...	·04	·3	31st do. ...	...	...	1·73	2·2
5th do. ...	5·80	1	·76	·4	32nd do. ...	1·40	2	2·11	2·5
6th do. ...	·71	1	·01	·3	33rd do. ...	·10	1	2·26	3·1
7th do. ...	...	...	·04	·2	34th do. ...	·25	1	4·19	3·6
8th do. ...	·28	1	·03	·3	35th do. ...	7·50	3	5·33	3·8
9th do. ...	...	...	·14	·3	36th do. ...	...	...	3·50	2·4
10th do. ...	4·93	4	·68	1·1	37th do. ...	5·01	4	·62	1·3
11th do. ...	·42	1	1·20	2·3	38th do. ...	...	...	·36	·7
12th do. ...	...	...	·34	1·9	39th do. ...	·10	1	·19	1·0
13th do. ...	1·31	2	·44	2·1	40th do. ...	...	...	·03	·4
14th do. ...	·84	1	·20	1·3	41st do. ...	...	...	...	...
15th do. ...	1·58	3	1·26	2·5	42nd do. ...	...	...	·58	·6
16th do. ...	2·26	3	·76	3·1	43rd do. ...	·10	1	·47	·2
17th do. ...	·78	1	1·07	2·5	44th do. ...	...	...	...	...
18th do. ...	...	...	1·30	2·5	45th do. ...	...	...	·70	·6
19th do. ...	·99	3	1·54	2 8	46th do. ...	...	...	·02	·1
20th do. ...	1·10	1	·55	2·5	47th do. ...	...	...	·12	·1
21st do. ...	·25	1	1·38	2·1	48th do. ...	·77	1	·07	·1
22nd do. ...	2·55	1	1·36	2·7	49th do. ...	...	...	·08	·4
23rd do. ...	2·41	5	·66	2·2	50th do. ...	...	...	...	...
24th do. ...	2·82	2	·87	1·8	51st do. ..	...	...	...	...
25th do. ...	·50	1	1·54	2·4	52nd do. ...	...	...	...	...
26th do. ...	2·31	3	1·00	1·7					
27th do. ...	1·15	1	1·43	2·2	Total ...	68·98	59	47·23	73·3

Office-work.

5. The large amount of arrears of office-work, which had accumulated prior to the appointment of my Assistant, is rapidly being reduced. I trust to be able to overtake this work before next cold season, if I can remain at my Head-Quarters until then.

6. The following professional questions, which are a few selected from those put in the demi-official letters received by me during the past year, have been answered :—

Presidency, Province, or District from which the Questions came.	General Nature of Questions.
Tanjore	Asking what foods are best suited for use in fattening cattle and sheep.
Do.	Asking for advice regarding a course of reading on agriculture.
Mysore...	Asking for information regarding the cultivation of maize as a field crop.
Nilgiris	Asking for an explanation regarding the differences in the action of two mixtures of manures which had been applied to land planted with coffee.
Coimbatore District...	Asking opinion regarding the nutritive values of certain grasses.
Chingleput District ...	Asking for advice regarding the cultivation of Guinea grass.
Rajpootana.	Asking advice regarding the reclamation of soil covered by an efflorescence of salt.
Cuddapah District ...	Asking opinion regarding a proposal to introduce a steam plough into the district for general agricultural use.

Presidency, Province, or District from which the Questions came.	General Nature of Questions.
Ganjam	Asking for information regarding the cultivation and uses of *Sorghum Saccharatum*. Also for details of Carolina paddy cultivation.
Hyderabad	Asking for information regarding foods best suited for feeding dairy stock and for fattening cattle and sheep.
Tanjore	Asking for advice regarding the sub-soil drainage of swamp land.
KistnaDistrict	Asking for advice regarding the adoption of improved methods of cultivation.
Travancore	Asking for advice as to the improved agricultural implements and tools best suited for the use of the ryot.
Coimbatore District...	Asking advice regarding the cultivation of plants with large fleshy roots.
Bombay	Asking for information regarding the cultivation of Carolina paddy.
Punjab...	Asking advice regarding a course of reading on agriculture.
Nilgiris	Asking advice regarding the feeding of stock on ground-nut cake.
Chingleput District...	Asking for advice regarding the cultivation of Casuarina trees.
Nilgiris	Asking for advice regarding reaping machines in view to the selection of one for cutting grass on the rough grass land of the district.
Wynaad	Asking opinion as to the action of lime on a soil, and the quantity to be applied to a soil under coffee cultivation.
Mysore	Asking advice as to the treatment of sheep newly imported from Europe.
Travancore	Asking for advice regarding the analysis of a soil.
Nilgiris	Asking advice regarding the selection of a chaff-cutter suited for the use of a planter.
Coimbatore	Opinion asked regarding the quality of a sample of tobacco and of wheat.
Wynaad	Asking advice regarding the selection of a chaff-cutter for use on a coffee estate where a large number of cattle are kept.
Cuddapah	Asking for information regarding the construction of a "double mhote" for raising water.
Trichinopoly	Asking for advice regarding the selection of a breed of sheep for introduction into the district.

Agricultural Apprentices.

7. In the Sydapet Farm Class there were at the close of the year six apprentices ; the only change that took place in this class during the past year was the removal of one of the youths from the class, who had obtained employment as a Farm Overseer in Mysore, and the appointment of another youth to fill the vacancy his removal caused.

8. The District Farm Class at the close of the year consisted only of two apprentices, it having been thought unadvisable to fill up the vacancies that had occurred in this class, pending the receipt of the decision of Government regarding the whole question of agricultural education, which question had, for some time, been under consideration.

9. The District Farm class was examined in June last. The following are the results of that examination :—

——	Full Marks.	A.	B.	C.
Paper Examination.				
1. Mention what crops are growing in fields Nos. 8, 10, 13, 14, and 23 ?	5	4	4	5
2. Mention the hours during which the draught cattle are daily employed	5	5	5	5
3. What area of land, under a crop drilled 18 inches apart, can be hoed by a bullock hoe during an ordinary working day, the land being in good condition ?	5	...	...	...

	Full Marks.	A.	B.	C.
PAPER EXAMINATION.—(*Concluded.*)				
4. On the Experimental Farm in what month are the ewes generally put to the ram? and in what month are most of the lambs born? also, in what month are the lambs usually weaned?	10	8	8	10
5. If a plough travels at the rate of $1\frac{1}{2}$ miles an hour, turning a furrow slice 9 inches wide, what area of land will it plough during a working day of 8 hours, assuming that 25 per cent. of the time is lost in turning at the head-lands?	10	5	8	...
6. What is the average cost at present on the Model Farm of excavating a cubic yard of earth and carrying it a distance of 20 yards?	5	5	5	5
7. Mention the number of permanent (broad) incisor teeth and the number of temporary (milk) incisor teeth in the mouth of a three year old sheep	10	...	...	...
OUT-DOOR EXAMINATION.				
1. *Ground-nut Oil-cake.*—Recognise? Why is it used on the Sydapet Farms in preference to other kinds of feeding stuff? What quantity is given per head to each kind of stock? What price is paid for it per 100 lbs.?	10	9	9	3
2. *Seed Drill.*—Explain how it works when sowing, and how it can be altered to enable it to sow in lines with narrow or wide intervals between; and how the depth at which it sows is regulated?	5	5	5	5
3. *Winnowing Machine.*—Explain its construction and the uses of its various working parts	5	5	3	...
4. *Expanding Drag Harrow.*—Explain its uses, and mention the advantages possessed by such a harrow over one of the ordinary kind	5	3	5	2
5. *Bullock Hoe.*—Explain its construction and its uses	5	3	5	2
6. *Sheep.*—Point out in the flock a good specimen, and state in detail why the selection is made	5	4	4	3
7. *Poultry.*—What breeds of poultry have succeeded best on the Experimental Farm? In what respect do the birds of the breed now kept differ from ordinary country fowls?	5	4	4	1
8. *Mauritius Maize.*—Recognise variety? What quantity of seed per acre should be sown? How should the land be prepared for maize? When should maize be sown in this district? and when is the crop usually harvested?	10	8	8	6
Total ...	100	68	73	47

10. I have again and again, in my reports, drawn attention to the many imperfections of the system of training, under which the youths in the apprentice classes at Sydapet are supposed to gain a knowledge of agriculture, and have pointed out, more especially, the mistake of trusting entirely to field-training to qualify Hindoo youths as agriculturists; and I am glad that this view is now held by Government who, in a recent Order, sanctioned the abolition of these apprentice classes, and authorised instead the Establishment of a School of Agriculture in which youths of the class to which these apprentices belong, and others desiring to become agriculturists, may meet with facilities for gaining a thorough knowledge, both practical and theoretical, of agriculture.

Permanent Improvements on the Sydapet Farm Estate.

11. The services of one of my Assistants being available for employment, I thought it advisable to avail myself of the opportunity thus afforded me for carrying out, under competent superintendence, certain extensive works of improvement on this property, which, in most instances, had been allowed to stand over during a considerable period owing to my inability from pressure of work to undertake them.

12. Amongst other improvements undertaken were the following :—A new road, measuring nearly a mile in length, was opened on the eastern side of the estate ; this road connects the Model Farm roads with those on the Experimental Farm ; the portion that runs through the Model Farm is of great use in affording the means of gaining access to land which previously could not be reached by carts. The surface of nearly all the undulating sandy land on this property has been greatly altered and in many cases terraced ; this was done in view to prevent further injury to the soil during heavy rains, by inducing a larger proportion of the water that falls to pass down into the soil. I had at one time hoped that it would have been possible to have avoided undertaking this heavy work, but further experience proved that it was unwise to persist longer in the attempt to bring these sandy slopes into a good cultivatable condition by manure and cultivation alone. These soils, which contain on the average from 90 to 95 per cent. of sand, would retain nothing in the shape of manure during heavy rains, the manure being almost entirely washed out of the land and carried with a finer particles of the surface soil away down to lower levels. The surface of a considerable area of other land situated within the limits of the Model Farm was also greatly altered to enable the land to benefit by occasional irrigation from the Marmalong Tank, and by water to be brought by the new channel from the Chembrumbakum Tank. On the Model Farm a large amount of work was executed in re-forming the beds under which the wet land was divided, which was rendered necessary by the crooked, irregular boundaries of these beds interfering so greatly with the cultivation and with the irrigation and drainage of the land. On the same Farm a small plot of land, which was in a very swampy condition, was thoroughly sub-soil drained and rendered dry and healthy. A new boundary fence was constructed on the western side of the Experimental Farm. The necessary repairs were done to the various buildings on the estate. A number of Casuarina and other trees were planted over the property.

13. *Concrete.*—This material was largely used on the Sydapet Farms during the past year ; it was generally formed of the following ingredients :—One part of lime, five parts of broken bricks, and two parts of sand, prepared as follows : the lime having been thoroughly slacked and the bricks broken up to about the size of walnuts, they were, with the sand, thoroughly mixed together while dry, after which a quantity of water was thrown over the heap, and the whole thoroughly blended.

14. The concrete has proved especially efficacious when used for protecting the floor and sides of drains in which the fall was great. The outfall of a large open drain through which a great quantity of water occasionally passes was much improved last year by being coated with this concrete ; though built of large stones, it very frequently needed repairs ; various simple means had been tried to protect the slope from damage, but none were at all successful, and stone-in-lime would

have been too costly. This outfall was particularly well suited to test the value of concrete as a protection where the wash is great, as the water was discharged from a height about 10 feet above the level of the drain beneath, and in its descent passed over the concrete covered slope. The result of the experiment has been most satisfactory. On another part of the estate, the arch of a small bridge was made with concrete, and, though it has been frequently submerged by the river, it has stood remarkably well. For making water channels, the concrete has proved most useful. The following result shows the cost that was incurred for making 72 running yards of channel, the inside dimensions of which were, depth 8 inches, and width 8 inches, the walls and floor being 4 inches in thickness:—

	RS.	A.	P.
Breaking bricks—2 men, at 3 annas a day, and 13 women, at 2 annas per day ...	2	0	0
Refuse bricks and cart-hire ...	2	4	0
Mixing concrete and making drain—10½ coolies, at 3 annas per day ...	1	15	6
Lime for concrete—10 parahs, at 12 parahs per Pagoda...	2	14	8
Lime for smooth coat—6 parahs, at 12 parahs per Pagoda ...	1	12	0
Bricklayers' hire for laying on smooth coat and finishing drain ...	3	7	0
Total ...	14	5	2
Per running yard ...	0	3	2

15. Concrete is a much cheaper material than brick-in-lime for many purposes in which the latter is employed, and its use ought to be much extended in this country where the bricks are generally so very inferior. A lime concrete, such as described, is not well suited for building walls above ground, for this purpose a cement concrete is generally used.

16. The following shows the cost at Sydapet of 100 cubic feet of concrete and of 100 cubic feet of brick built in lime:—

Concrete.	RS.	A.	P.
Refuse bricks and cart-hire...	2	4	0
Sand, 2 cart-loads ...	0	4	0
Lime, 7 parahs ...	2	0	8
Breaking 35 parahs of bricks ...	0	10	0
Bricklayers' hire for building 100 cubic feet of concrete, at 3 pies per cubic foot ...	1	9	0
Total ...	6	11	8
Cost per cubic foot ...	0	1	1
Brick-in-lime.			
2,000 bricks ...	6	0	0
10 parahs of lime ...	2	14	8
3 cart-loads sand ...	0	6	0
100 cubic feet of building, at 6 pies per cubic foot ...	3	2	0
Total ...	12	6	8
Cost per cubic foot ...	0	2	0

17. Concrete can be prepared from the refuse bricks of old buildings that are useless for any other purpose, road-making excepted; the more they are broken and covered by old mortar, the better they are suited for use in this way. Concrete will be of great value for many agricultural purposes in this country, and there is in most localities an abundance of material in the shape of old walls, tumble-down buildings, &c., the removal of which would considerably improve the appearance of many of our towns and villages.

Snakes, &c., killed.

18. The following statement shows the number of snakes, rats, and squirrels killed on the Sydapet Farm Estate for which rewards were paid during the past year :—

Cobras	24
Other snakes	139
Squirrels and rats	532

A much larger number of snakes were killed in the previous year, and I hope that the small number killed last year may be taken as evidence that we are succeeding in killing down these dangerous pests, for there were peculiar facilities last year for killing snakes, as from the long drought the fields were bare during a much longer period than is usual, and I believe that the coolies are now as ready as ever they were to earn the small rewards given for killing snakes. There were no deaths during the past year amongst Farm coolies from snake-bite, but amongst the Farm live-stock there were several deaths that were attributed to this cause.

Agriculture in the Madras Presidency.

19. The following facts throw some light on the real condition of agriculture in this Presidency, regarding which such opposite opinions are held :—

20. (*a*) *Small proportion of the area of the Presidency now utilized.*—The entire area of the Presidency comprises 138,318 square miles, or 88½ millions of acres ; of this, 50,623 square miles consist of permanently assessed properties, Government forests, and hill tracts, leaving 87,695 square miles, or 56,124,800 acres directly under Government. Of this 56 millions of acres, only 27⅓ millions of acres are under occupation ; there is thus nearly 30 millions of acres of Government land altogether unutilized.

21. (*b*) *Small revenue received from the land in the shape of rent.*—The total area under occupation last year was 27,360,000 acres, and the total rent collected was 34,933,583 rupees, which is only Rupees 1-4-5, or about 2*s*. 4*d*. per acre.

22. (*c*) *Low value of the produce of an acre of cultivated land. Dry land.*—During the last official year there were 13,895,331 acres under dry cultivation in the Madras Presidency (excluding South Canara and Malabar, for which I have no figures) that paid rent, amounting to 15,009,850 rupees, an average of Rupees 1-1-3, or about 2*s*. per acre. With these figures it is very easy to ascertain the average value of the produce of an acre of dry land by means of the formula used in fixing the rent in this Presidency, which is as follows :—From the money value of the estimated outturn, a deduction of one-quarter is made as an allowance for unfavorable seasons ; and from this remainder, the cultivation expenses are deducted, and thus the net value of the crop is ascertained, half of which forms the Government rent. Thus it is only necessary, in order to arrive at the net value of an average crop, to multiply by 2 the sum received as rent for one acre, which is Rupees 2-2-6, or 4*s*. To the amount thus obtained, we must add the cultivation expenses which are said by the Settlement Department to average about Rupees 4-10-3. By adding this sum to the net value of the produce already determined, we get Rupees 6-12-9 per acre ; to which if we add the one-fourth deducted to provide for unfavorable seasons, we will ascertain the average value of the produce raised on one acre of land under dry cultivation in this Presidency, which is Rupees 8-7-11, or about 15*s*. 7*d*. excluding the value of the straw, which is taken as a set-off against the keep of the cattle which forms no charge in the cultivation expenses. *Wet land*—It is not quite so easy to arrive at the average value of the produce of an acre of land under irrigation. There were last year in the Madras Presidency (again excluding South Canara and Malabar) 3,105,622 acres under wet cultivation, for which, in the shape of rent, 16,873,137 rupees were received, which is Rupees 5-6-11, or about 10*s*. per acre. To ascertain the average value of the produce on one acre of this land, we must proceed in the same way as we did in determining the value of the produce of dry land ; thus, twice the amount of the rent represents the net value of the produce which is Rs. 10-13-10,

to this we add the cultivation expenses, which are said by the Settlement Department to average about Rupees 7-9-9 per acre, which, added to the net value of the produce, makes Rupees 18-7-7 per acre. In fixing the rent of wet land, the deduction made for unfavorable seasons is only one-sixth ; this, added to the figures previously obtained, brings up the total to Rupees 21-8-10, about two pounds sterling as the average value of the produce of an acre of irrigated land, less the value of the straw, which, for the reasons stated when referring to dry crops, is omitted in the calculation.

23. (*d*) *Small incomes of the Cultivators.*—It is very easy to ascertain the amount of income enjoyed by Cultivators in this Presidency, if the information contained in the previous paragraph is accurate ; thus it is only necessary to deduct the annual rent from the value of the produce of an acre of land, and the balance that remains is the income of the Cultivator and his family for their joint labors. If we take for illustration the renter of a holding of 12 acres, 10 acres of dry land, and 2 acres under irrigation, the annual income derived therefrom will be as follows :—

	RS.	A.	P.
10 acres of dry land, the produce of which is valued at Rupees 8-7-11 per acre	84	15	2
2 acres of wet land, the produce of which is valued at Rupees 21-8-10 per acre	43	1	8
	128	0	10
Deduct rent, 10 acres of dry land, at Rupees 1-1-3 per acre, and 2 acres of wet land, at Rupees 5-6-11 per acre	21	10	4
	106	6	6

From this it would appear that the total income derived from a 12 acre holding to repay the Ryot for the labor of himself and family, and expenses incurred in cultivation throughout a year, would be in a favorable year only Rupees 106-6-6, and in an average year, deducting the one-fourth allowed for bad seasons, only Rupees 79-12-11, or about Rupees 6-8-0 per mensem equal to three shillings per week.

24. (*e*) *Large proportion of occupied land under fallow.*—Of the 27,360,000 acres under occupation, 4,996,000 acres were last year under bare fallow, produced no crop whatever, and paid no rent.

25. (*f*) *Low type of crops generally grown and the small area under crops that need manure and moderately good cultivation.*—Of the 22,364,000 acres under crops, food grains occupied 18,385,000 acres, of which 26,000 acres only consisted of wheat ; this crop is perhaps not so well suited for cultivation in the southern half of the Presidency, as it is for culture in the northern half ; but even in the districts peculiarly suited for its cultivation, it occupies but a miserable proportion of the land under food grains ; thus :—

District.	* Total Area under Food Grains.	Of which Wheat occupies.
		ACRES.
Salem	1,432,000	1,000
Nilgiris	34,000	3,000
Coimbatore	2,089,000	3,000
Kurnool	1,700,000	8,000
Bellary	2,909,000	6,000
Cuddapah	1,527,000	3,000
Kistna	1,657,000	2,000

* Includes some land twice charged, being cultivated with 2 crops during the year.

The area under wheat might be very largely increased especially in the districts to which I have just referred. Wheat requires moderately good cultivation with a fair allowance of manure; taking this into account in connection with the certainty that there is in this country a good market for wheat at renumerative prices, the miserable position it occupies in the cropping of the Presidency is, I think, conclusive evidence of the low condition of the agricultural practice pursued. Again sugarcane is another crop which requires manure and moderately good cultivation, and this occupied but 36,000 acres of the 22½ millions of acres under crop last year, and it grows well nearly in all parts of the Presidency.

26. (*g*) *The entire absence of any fodder or root crops raised for the food of stock.*—There is no crop especially grown for feeding stock which in any way resembles the fodder, roots, and other restorative crops of more civilized countries. Nearly every acre of the 22½ millions of acres was occupied by what is termed in agriculture an exhausting crop. As I have before pointed out, crops that need the liberal supply of manure are almost unrepresented in the cropping of this Presidency.

27. (*h*) *Low commercial value of the agricultural produce of Southern India.*—In the English Market, Madras cotton is generally from 25 to 50 per cent. less in price than American cotton; Madras rice is only about half the value of American rice; Madras tobacco will scarcely command a sale, excepting for the manufacture of sheep washes. Indigo, coffee, and tea command good prices, but then these are produced under European management.

28. (*i*) *Poverty of the arable soils of the Presidency.*—In the absence of analyses of the different arable soils of the Presidency it is exceedingly difficult to produce proof of their poverty in plant food, as the small crops obtained may be the result of inferior cultivation rather than due to the poverty of the soil. Though I am unable to produce evidence as conclusive as I should desire, I am able, from the results of the investigations made by Mr. Broughton regarding the quality of country tobacco, to produce some facts which throw a great deal of light upon the matter. Mr. Broughton determined only the quantity of carbonate of potash in the ash of the tobaccos he examined, however, the quantity of this mineral in the ash of the tobacco plant bears a very close relation to the quantity in the soil that produced the tobacco, and therefore the information gathered by Mr. Broughton possesses considerable value as indicative of the quantity of potash in the arable soils of the Presidency. The following are the results:—

Districts in which Tobacco was produced.	Number of Analysis.	Average per cent. of Carbonate of Potash in Ash.
Vizagapatam	7	9·76
Trichinopoly	6	6·01
Bellary	4	6.22
Nellore	2	6·96
Cuddapah	12	4·39
Tanjore	1	8·71
North Arcot	5	4·58
South Arcot	3	11·29
Nilgiris	2	17·81
Kurnool	5	5·73
Coimbatore	13	7·68
Kistna	10	13·52
South Canara	1	5·6
Madras	5	·70
Chingleput	2	·63
Madura	15	7·02
Salem	4	8·05

For comparison I give below a statement showing the quantity of potash in a few samples of tobacco produced in other countries :—

	Per cent.
Maryland tobacco	40·7
Do. do.	47·4
Massachusetts do.	47·8
Hungarian do.	26·46

Professor Emil Wolff of the Royal Academy of Agriculture, Wirtemberg, publishes seven analyses of tobacco, the ashes of which contained on the average 27·4 per cent. of potash, and one sample of which contained as much as 54 per cent. There is a very marked difference between the quantity of potash in the ash of tobacco raised in this Presidency, and, in other countries due, I think, entirely to the different quantity of potash in the soil.

29. To show what an important part potash plays in the food of plants, I would direct attention to the following, showing the quantity of potash in the ash of some of our more important agricultural products :—

	Per cent.
Potatoes	59·8
Turnips	39·3
Lucerne	25·3
Cotton lint	41·20
Cotton seed	35·44
Wheat	31·1
Barley	21·9
Maize	27·0
Paddy	18·4
Cholum	11·9

The deficiency of potash in the arable soils on which tobacco is grown, which are always more highly cultivated and manured than any other soil under crops, is, I think, strong evidence that our soils are gradually becoming exhausted.

30. The yield of the soils is also worth considering ; thus, while in Madras, the Ryot is contented to get 70 or 80 pounds of clean cotton per acre, the American Farmer is not contented unless he gets from 450 to 500 pounds per acre. The same with rice ; an average crop of paddy in this Presidency is about 15 bushels per acre ; in America, 70 bushels is no unusual crop. In Madras a maize crop of 10 bushels per acre is a good one ; in America crops of this grain vary from 50 to 80 bushels, and sometimes even amount to 100 bushels per acre.

31. (*j*) *The inferiority of the agricultural live-stock of the Presidency.*—The inferiority of our live-stock, with some slight exceptions, is so universally admitted that I need only mention this fact as another evidence in proof of the low condition of our agriculture.

Swamp Irrigation, &c.

32. I should be extremely sorry if any observations I have made in former reports, deprecatory of the irrigation practice of our Ryots, should be, in any way, accepted as antagonistic to irrigation, for no one can more highly appreciate the benefits that arise from the proper use of irrigation water than I do. It was the abuse of irrigation to which my condemnatory observations applied ; the almost universal practice in this country being to swamp the land instead of to irrigate it. It is exceedingly difficult to ascertain with any degree of accuracy the quantity of water that a Ryot would be contented to use in the cultivation of an acre of paddy ; he appears to think that he cannot use too much when the only trouble he is put to is to open a sluice. The following extract from a note by the Acting Chief Engineer for Irrigation on a report of an irrigation experiment made in the Godavery District in 1872 throws some light on the subject :—

"4. The actual quantities of water supplied per hour per acre, both artificially and by rain, are noted in the margin; water was first supplied on the 5th of May for the preparation of the seed-beds, and the last supply was obtained on the 20th of November. It is not stated when the crop was transplanted, but probably late in June or early in July, and hence the average supply during the season must have been about 4·87 cubic yards per hour per acre—a quantity which is known to be far above what is required."

	C. Yards.
From 5th May..................	·81
,, June	1·57
,, July	4·29
,, August	3·59
,, September..............	3·07
,, October	7·32
To 20th November...........	6·09

In the report on the experiment, it is stated as follows :—"3. The Cultivator was allowed to take water as he wished, but was looked after by a Lock Superintendent who lives near the spot, and a Delta Superintendent who frequently visited it, and they were supposed to see that he did not wilfully waste the water. The water could not be passed on to other cultivation." Here we have an instance of a sheet of water, an acre in extent, and 9 feet deep, used in addition to a rainfall of 26 inches, to bring to maturity one acre of paddy, and this, under the superintendence of Irrigation Officers, whose presence undoubtedly contributed to lessen the quantity of water that would otherwise have been used. I have no reason to suppose that this Ryot was more greedy in the use of the water than are other Ryots, who are equally favorably circumstanced for getting a supply. The quantity used in other irrigation experiments, made by the Public Works Department, varied from 6 feet to 7 feet in depth in addition to the rainfall to mature a crop of paddy. My experience proves that under moderately good cultivation, with a soil of fair average quality, a volume of water, one acre in extent, and about 4 feet in depth, would be ample for the production of one acre of paddy. Not only does swamp irrigation cause an enormous waste of a valuable producing power, but it is highly prejudicial in many other ways; the health of the people is injured; the soil is rendered unfit for cultivation, except under semi-aquatic crops of low types; and the capabilities of our irrigation works are seriously lessened by the smaller area thus watered. The following extract from a report on irrigation as practiced in Spain by Mr. Clements Markham is well worth consideration in connection with the subject on which I am now writing :—

"The cultivation of rice around the shores of the Albufera was introduced by the Arabs, and was prohibited on account of its unhealthiness and the waste of water it occasioned, by King Martin of Aragon in 1403 A.D. Permissions and prohibitions have alternated since that time, and Cavanilles recommended the total discontinuance of a cultivation which produced so many fevers and such swarms of mosquitoes. Attempts have been made near Valencia to grow rice without irrigation, but they were fruitless.

"It would certainly appear that, apart from its extreme unhealthiness, the cultivation of rice in this country is open to serious objections. The continuous harvests and incessant swamping wear out and enervate the land, and now the use of guano and other manures is essential. The rice is sown in April and May, and reaped in September, so that the swampy land is seldom exposed to the influence of heat, and the stagnant water keeps it in a constant state of saturation, and rapidly neutralizes its fertilizing properties. At present the cultivation of rice is very strictly prohibited beyond certain prescribed limits, and the use of guano as manure is believed to have decreased the pernicious effects of the swamped land, though in what way it is difficult to understand."

33. Indigenous paddy from long cultivation as a semi-aquatic crop has become peculiarly adapted for swamp culture, especially in the formation of its roots, which consist of a net-work of horizontal fibres, particularly well suited to support the plant on semi-liquid mud, and it is for this very reason that the plant is not suited immediately for drier cultivation, for, directly the soil is allowed to become at all dry, these surface roots are scorched by the sun and the plant withers; nevertheless, it can be cultivated successfully with a much less quantity of water than is

now frequently used; but for cultivation on wet land with a less expenditure of irrigation water, it would be better to select a variety of paddy the roots of which have a greater tendency to go down into the soil.

34. Though it may be true that the Indian Ryot seldom or never thinks of providing means for the removal of the excessive quantity of water he pours on his land during the cultivation of paddy, the Cultivators of this grain in other countries are not so neglectful; in the agricultural newspapers, published in the Southern States of America, I frequently meet with with inquiries addressed to the Editors, asking for advice regarding the treatment of paddy land. One correspondent, writing to the Editor of the Southern Cultivator, which is published in Georgia, in February 1874, writes as follows :—

"I write at the request of a friend who plants a thousand acres of rice, **** the ditches run from bank to bank at itervals of 30 feet, cut 3 feet deep, leading into side drains which are parallel with the embankments, cut 4 feet deep by 5 feet in width, emptying into a canal 6 feet deep by 30 feet clear water-way. You will see from this that the drainage is as thorough as practicable." The Editor, in reply, recommends still further attention to drainage. Another correspondent, an old South Carolina Rice Planter, in a letter to the "Rural South Land," published in New Orleans, in February 7th of last year, says :—

"Our rice planters should bear in mind the fact that, in order to obtain the best results, their rice lands must be thoroughly drained." And as regards Spain, Mr. Markham, in the report before alluded to, says :—

"One of the most important parts of the Murcian irrigation system is that which provides for the drainage of surplus water. The sub-soil is a stiff tenacious clay, and arrangements for preventing the accumulation of stagnant water and the formation of swampy ground are particularly urgent. The irrigating channels flowing from the right bank of the *Azequia Aljufia* terminate at the river, but those from the left bank are led down the valley, and have no natural outlet for their surplus water. Very deep trenches, called *azarbes*, are, therefore, dug in the lower part of the garden of Murcia, which receive, not only the unused water of the channels, but also the drainage of the irrigated land."

35. It is frequently remarked by persons, who ought to know better, "that, if the Indian Ryot knows but little regarding dry-land cultivation, he has nothing to learn regarding wet-land culture." This is, I think, a most serious mistake, for, as far as my experience goes, the cultivation of wet land in this country is but little, if at all, superior to the cultivation of dry land. To produce an average crop on a good soil, with the aid of an abundant supply of water, is no test of the quality of the farming practiced; the question is whether this good soil could not, with half the quantity of water generally used, be made to produce as good results; and in this way double the area under irrigation, at the same time improve the sanitary condition of the country and maintain the productive powers of the soil over a longer period.

Treatment of Salt Lands.

36. I have had but little personal experience in the treatment of land rendered barren by an excess of salt. There were on the Sydapet Experimental Farm two or three plots of very limited areas, on which, in dry weather, there was a light covering of salt, caused evidently by the absence of sub-soil drainage, the plots in each instance being surrounded on two sides by water, the ordinary level of which was only a few inches below the surface of the land. I tried various means to get rid of this excess of salt, but none were quite successful. Amongst the means tried were dressings of different mineral manures, such as carbonate of lime, sulphate of lime, ashes, &c., deep ploughing, frequent surface washings by fresh water, and dressings of sand and of farm-yard manure. Of these, the last mentioned produced the best results. I tried various crops on the land, which were known to be salt-feeders, but in no instance did I succeed in

obtaining a fair covering of plants, or in bringing any to maturity. I have had many opportunities for ascertaining the conditions under which, in this Presidency, salt generally appears on arable soils. From the Kistna District, in which large areas of land have been injured from this cause, I received from the late Mr. Boswell, the Collector, much valuable information and a large assortment of samples of the different soils so injured. From this and other information I have collected, I am strongly inclined to believe that the only effectual way of curing permanently the land so injured is to drain it thoroughly by means of sub-soil drains. The following information may, however, prove interesting and in some cases be of use. It refers to the method adopted by the Ryots of the Coimbatore District in treating land rendered unfertile by an excess of salt. The information was collected by the Tahsildars of the district, and was kindly placed at my disposal by the Collector, Mr. Wedderburn.

37. *Coimbatore Tahsildar's Report.*—"Salt lands are first levelled and subdivided into plots by banks one-and-half feet high. The plots are then manured by the plants peranday, milk-hedge, kolanji, yerukalay, auvaray, púngay, and other plants and creepers, and these plants are trod into the mire as well as excreta of cattle, &c. If these plots are occasionally watered for twenty days, the plants will not have a bad smell and mix with the earth. The salt is taken off by the fermentation which these plants produce. This method should be practised twice a year, and that for three years."

38. "There is another mode of improving salt lands. The skins of several kinds are soaked in water till they have a bad stench. This water with hairs, &c., is applied to the plots which are watered again. After a period of about ten days this water is drained off and the land is again watered."

39. "But the salt will come up again in lands improved thus if there is excessive rainfall in the proper season of the year."

40. "The rich Ryots will practise these methods often and often and keep their land free from salt. But the poor Ryots are unable to manure their land so often; their land once improved again gets impregnated with salt."

41. *Suttimungalum Tahsildar's Report.*—" The lands are first ploughed and watered, then the following plants, &c., are applied to them to take off the salt, *i.e.*, kolinji, auvaray, yerukalay, peranday, púngay, prickly-pear, silt sand, and dust. This method the cultivators practise for two or three years. In some places prickly-pear is raised in the salt land and left to grow for four or five years, after which the plants are cut and the land ploughed and cultivated. In the same manner aloes are planted on such lands and allowed to stand for three or four years. These two plants, the cultivators say, eat off the salt from the lands."

42. *Collegal Tahsildar's Report.*—"To improve the salt lands which have best soil half or one foot below the surface, the Ryots, after well ploughing the lands, collect water in them, and after draining the water off they apply to them manure and plants, such as yerukalay and others. And when the lands have extracted all the juice of the plants, they cultivate them. But, if there is no good soil many feet below the surface, such lands are excavated to the depth of half a-yard and the pits so made are filled either by good soil or silt. These improvements are done to wet lands only. In case of punjah lands such a trouble is not for the most part taken. The lands of this kind are improved in course of years by manuring them with sweepings, ashes, and other manure."

43. *Perindooray Tahsildar's Report.*—"It appears that the cultivators apply to their salt lands the following plants, &c., to take off the salt from the land, *i.e.*, peranday, yerukalay, auvarary, kolinjy, leaves of púngay, milkhedge, and vélan bark after the arrack is extracted from it. They tread these plants into the land and plough it over and over again, and continue the method for two or three years. If the salt remains in the field after this improvement, they raise in the fields dams two or three feet high and collect the water in the fields; this they practise

in three or four years. If improved in this way, the salt no doubt goes away from the field. Expense for raising these dams is not great because they do this gradually."

44. *Caroor Tahsildar's Report.*—"To salt lands which are cultivated with wet crops the people apply, after they are watered and ploughed, the following plants, *i.e.*, peranday, aloes, thoombay, yerukalay, auvaray, milkhedge and leaves of pungay and peroomarum, and to garden lands they apply the ears of cumboo after taking the grains off in addition to the above-mentioned herbs."

45. These they put in their fields ploughed and watered, tread them in the mire, and keep the field in this state till the plants are rotten. If prepared thus, the salt will go out. In punjah (dry) lands dams are raised in the fields to collect water from the rain and then the water drained off together with the salt."

46. *Pollachy Tahsildar's Report.*—" On punjah (dry) salt lands the Cultivators apply the chaff of grains, sweepings, and other manure for three or four years, and these take off the salt from the land. If there be excess of rain, the lands thought to be freed from the salt will become unfit for cultivation. For wet lands they apply kolinjy, yerukalay, and peranday, after draining the land ploughed and prepared for the purpose. These plants are rotten and then get mixed with the mire. They again plough the field and apply to it the sweepings and stalks of raggy, &c. Thus the salt is taken off the lands. This process is carried on every year; one year's improvement is of no use."

47. *Palladum Tahsildar's Report.*—" The fields are first levelled to collect the water from rain, then the plants, aloes, kolinjy, yerukalay, and milkhedge are mixed with the mire. Afterwards the fields are divided into plots as the wet lands are and cultivated for two years with paddy. At times the silt of the beds of tanks is placed in the field. These, the Cultivators say, are the methods by which the salt is taken off the fields."

48. *Dharapuram Tahsildar's Report.*—" It seems that Cultivators manure their salt lands by the plants peranday, kolinjy, and aloes, and then plough it twice or thrice. Some people make their salt lands fit for cultivation by spreading over them to the height of a span the loose sand blown by wind."

49. " Another method of improving salt land is to apply wool to the land and plough it."

50. *Bhowany Tahsildar's Report.*—" The plants, yerukalay, auvaray, pungay, peranday, kolinjy, and parappoodoo (a plant supposed to grow on rocks) are applied to nunjah (wet) salt lands, which are then cultivated."

51. " In some places the people procure manure and sweepings at little or no expense, which they apply to their lands."

52. " The practice of using milkhedge to the fields does not exist in this district as the people are unable to get it in quantities required."

53. " Salt punjah (dry) land is manured by the dung of cattle, herds of which are for the purpose collected on the land."

54. " The practice of collecting water in the field after ploughing it during the rainy season does not exist in this part of the district. It seems that this method should be applied only to the lands which are sloping, but if applied to the flat land the salt will not go out."

55. " The people do not take so much care about their salt lands after the fall of rain, but go with their ploughs to their better lands."

56. " In some places salt lands of all kinds are cultivated with hemp or flax, and the people say that the leaves of these plants serve as manure. But this practice does not seem to be extensive."

57. *Udumulpettah Tahsildar's Report.*—"On inquiring of the wet land cultivators about the mode by which they improve their salt lands to be fit for cultivation, it appears that, after ploughing those lands, they annually apply to them the plants peranday, kolinjy, and auvaray in bundles, tread them into the mire, and keep the land in this state till those plants are rotten. Then they plough the lands and sow paddy in them, which yield a pretty good return as the salt does not come up; but this will not wholly free the land from salt."

58. The plants and leaves generally applied for improving the salt land are the following :—

Auvaray = Cassia Auriculata.
Kolinjy = Galega.
Yerukalay = Asclepias gigantia.
Peranday = Cissus quadrangularis.
Poonga = Dalbergia Arborea or Pongamia glabra.
Patchan or Kally = Milkhedge.
Thoombai = Phobius Indica.

(Signed) A. WEDDERBURN,
Collector.

Market Prices.

59. The entire absence of trustworthy information, regarding the current rates prevailing at one time in different parts of this Presidency, for agricultural productions, is a serious drawback to the prosperity of the country. At present prices are liable to great fluctuations; a rise of thirty per cent. and a fall of a similar amount are far from unusual, and frequently for no sufficient reason; but not only do the prices at any given market fluctuate greatly, but those prevailing at that market and at another market situated at no great distance differ almost as widely. Before the extension of railways, canals, and good roads over the country, great fluctuations in prices and wide differences in those ranging at one time in different localities were only to be expected; but, now that the facilities are so much greater for the conveyance of agricultural produce over the country, we might reasonably expect that the prices would be more uniform and less liable to sudden and great changes.

60. Great fluctuations in prices are beneficial neither to the farmer nor to the consumer of his produce; as a rule they seldom arise directly from natural causes, but spring from the machinations of speculative middlemen, who are the chief gainers by unsteadiness of prices. Ryots seldom keep any agricultural produce on hand for any length of time; their surplus grain they generally sell soon after it is harvested, when it is bought up by these speculators, who utilize every opportunity for raising prices by keeping back produce, by circulating incorrect information regarding the prices prevailing in other districts, and by endeavoring to create undue apprehensions regarding the effects of floods or drought on growing crops, &c., &c.

61. Under present arrangements these middlemen are of much use to the country in keeping up something like an equilibrium between supply and demand; in their absence the Ryot would at one season overstock the retail market and at another leave it altogether unsupplied. But these middlemen have at present too much power, a power which would be much lessened if reliable current price lists were published by Government once a week for general information.

62. Something is now attempted in the way of providing Agricultural Price Lists for the Madras Presidency, but the monthly statements when printed are generally three months in arrears, and therefore are not of the least practical value to agriculture.

THE SYDAPET EXPERIMENTAL FARM.

Live Stock.

63. *Cattle.*—In June we imported the Aden cattle referred to in my last report. One of the cows died during the voyage; the remaining animals, consisting of one bull, one cow, and two

calves, reached Madras in safety, but were all much out of condition when landed. The cost of the stock in Aden was Rupees 208-14-0, and for their conveyance, &c., to Madras, the charge was Rupees 630-12-0, making the total outlay on account of this importation Rupees 839-10-0. These animals are not nearly so good as I had expected that they would be ; and, if they are fair specimens of the breed, which I have every reason to believe they are, the Aden breed has been much overpraised. I make this observation with reference to their form and their general quality only ; I have not yet had an opportunity of forming a conclusive opinion regarding the milk-producing capabilities of the cow, though, from the fact that she has reared her own calf along with the calf of the cow that died, she cannot be very inferior in this respect. Both the calves are bulls ; one, the calf of the cow that died, is much inferior in form and quality to the other. If the cow should prove to be a good milker, her defects in shape may be overlooked, for it must be remembered that there are several highly-valued breeds of dairy stock in Europe, the cows of which are exceedingly irregular in form. If, by the use of bulls of the Aden breed amongst the dairy stock of the Ryot, we can succeed in producing a cross the cows of which will possess larger milk-yielding capabilities, the experiment will have been fairly successful, and the improvement in form may be attempted by the use of bulls of some other breed.

64. The services of the bulls on the Experimental Farm are now free, the small fee formerly charged being dispensed with. I made this change as I found that the fee tended to keep Ryots from sending cows to the bulls. The result has been satisfactory in the services of the bulls being in greater request than when a fee was exacted, and the amount annually collected from fees was always an exceedingly small sum. The services of the Aden bull have not been in such demand as I had anticipated, but this may be because the breed is as yet but little known to Ryots. In size and in weight the bull is well fitted for use amongst the cows of the district.

65. In my report for 1872 I gave some statistics showing the quantity of milk yielded by a Nellore cow during a period extending over twelve weeks. I have now much pleasure in being able to quote similar statistics regarding another cow (the produce of a cross between a Devon bull and a Nellore cow) ; the results of the experiment have been kindly placed at my disposal ; they have been collected with great care, and are thoroughly reliable. The registrations began from the third day after the cow calved (her third calf) and extended over a period of six months. During the whole of this time the daily food of the cow consisted of green fodder 40 lbs., ground-nut cake 4 lbs., and wheat bran 2 lbs., and about a dessert spoon of salt ; the ground-nut cake was steeped and mixed with the bran, half being given in the morning and half in the evening ; the cow was kept tied in the byre except for about two hours daily, when she was let out for exercise and to be washed ; she was milked at about seven in the morning and at five in the evening. While the cow was being milked the calf was always tied near her in the usual way, and was allowed to strip the udder, a sufficiency of milk being left for the wants of the calf. The following are the registrations :—

—	Morning.		Evening.		Total.		
	MRS.	OLKS.	MRS.	OLKS.	MRS.	OLKS.	PINTS.
1st day ...	3	2	2	6	6	0	
2nd ,, ...	3	2	2	7	6	1	
3rd ,, ...	3	3	2	7	6	2	
4th ,, ...	3	4	2	6	6	2	
5th ,, ...	3	7	3	1	7	0	
6th ,, ...	3	7	3	0	6	7	
7th ,, ...	4	4	3	0	7	4	
1st week ...	25	5	20	3	46	0	138
8th day ...	3	6	3	0	6	6	
9th ,, ...	4	0	3	0	7	0	
10th ,, ...	3	6	2	4½	6	2½	
11th ,, ...	3	6	2	6½	6	4½	
12th ,, ...	3	2½	2	7	6	1½	
13th ,, ...	3	5	2	2½	5	7½	
14th ,, ...	3	0	2	7	5	7	
2nd week ...	25	1½	19	3½	44	5	134
15th day ...	3	3	2	1½	5	4½	
16th ,, ...	3	4	2	7	6	3	
17th ,, ...	3	5	2	4	6	1	
18th ,, ...	3	4	2	3	5	7	
19th ,, ...	3	5	2	3	6	0	
20th ,, ...	3	5	2	3	6	0	
21st ,, ...	3	4	2	3½	5	7½	
3rd week ...	24	6	17	1	41	7	126
22nd day ...	3	2	2	4	5	6	
23rd ,, ...	3	5	2	4	6	1	
24th ,, ...	3	4	2	5	6	1	
25th ,, ...	3	2½	2	5	5	7½	
26th ,, ...	3	2½	2	6	6	½	
27th ,, ...	3	2	2	7½	6	1½	
28th ,, ...	3	4	2	6	6	2	
4th week ...	23	6	18	5½	42	3½	127
29th day ...	3	3	2	5	6	0	
30th ,, ...	3	6	2	6½	6	4½	
31st ,, ...	3	6	2	6	6	4	
32nd ,, ...	3	6	3	0	6	6	
33rd ,, ...	3	2	3	0	6	2	
34th ,, ...	3	5½	2	7	6	4½	
35th ,, ...	3	5	2	6	6	3	
5th week ...	25	1½	19	6½	45	0	135
36th day ...	3	5	2	6	6	3	
37th ,, ...	3	5	2	6	6	3	
38th ,, ...	3	3½	2	4	5	7½	
39th ,, ...	3	3½	2	4	5	7½	
40th ,, ...	3	0	2	3	5	3	
41st ,, ...	3	0	2	2	5	2	
42nd ,, ...	3	1	1	6	4	7	
6th week ...	23	2	16	7	40	1	120

—	Morning.		Evening.		Total.		
	MRS.	OLKS.	MRS.	OLKS.	MRS.	OLKS.	PINTS.
43rd day ...	2	7	2	3	5	2	
44th ,, ...	2	7	2	4	5	3	
45th ,, ...	2	4	2	2	4	6	
46th ,, ...	1	6	1	3	3	1	
47th ,, ...	2	2½	2	0	4	2½	
48th ,, ...	2	2	1	7	4	1	
49th ,, ...	1	3	2	1	3	4	
7th week ...	15	7½	14	4	30	3½	91
50th day ...	2	5	2	1½	4	6½	
51st ,, ...	2	4	2	2	4	6	
52nd ,, ...	2	2	2	0	4	2	
53rd ,, ...	2	4	2	1	4	5	
54th ,, ...	2	4	2	0	4	4	
55th ,, ...	2	½	2	0	4	½	
56th ,, ...	2	4	1	7	4	3	
8th week ...	16	7½	14	3½	31	3	94
57th ,, ...	2	4	2	1	4	5	
58th ,, ...	2	3	2	1	4	4	
59th ,, ...	2	4	2	½	4	4½	
60th ,, ...	2	4	2	0	4	4	
61st ,, ...	2	4	2	0	4	4	
62nd ,, ...	2	1	1	7	4	0	
63rd ,, ...	2	4	2	2	4	6	
9th week ...	17	0	14	3½	31	3½	94
64th day ...	2	3	2	1	4	4	
65th ,, ...	2	2	2	0	4	2	
66th ,, ...	2	3	2	1	4	4	
67th ,, ...	2	2	2	1½	4	3½	
68th ,, ...	2	2½	2	0	4	2½	
69th ,, ...	2	1	2	0	4	1	
70th ,, ...	2	1	2	1	4	2	
10th week ...	15	6½	14	4½	30	3	91
71st day ...	2	4	2	1	4	5	
72nd ,, ...	2	2	2	0	4	2	
73rd ,, ...	2	3	2	0	4	3	
74th ,, ...	2	0	2	1	4	1	
75th ,, ...	2	4	2	1½	4	5½	
76th ,, ...	2	0	2	0	4	0	
77th ,, ...	2	1	1	7	4	0	
11th week ...	15	6	14	2½	30	½	90
78th ,, ...	2	0	1	7	3	7	
79th ,, ...	2	1	1	6	3	7	
80th ,, ...	2	½	1	7	3	7½	
81st ,, ...	2	½	1	6	3	6½	
82nd ,, ...	2	½	1	7	3	7½	
83rd ,, ...	2	5	1	7	4	4	
84th ,, ...	2	4½	1	7	4	3½	
12th week ...	15	4	12	7	28	3	85

—	Morning. Mrs.	Morning. Olks.	Evening. Mrs.	Evening. Olks.	Total. Mrs.	Total. Olks.	Total. Pints.
85th day ...	2	5	2	0	4	5	
86th ,, ...	2	6	2	1	4	7	
87th ,, ...	2	5	2	½	4	5½	
88th ,, ...	2	6	2	1	4	7	
89th ,, ...	2	6	2	1	4	7	
90th ,, ...	2	5	2	1	4	6	
91st ,, ...	2	4½	2	0	4	4½	
13th week ...	18	5½	14	4½	33	2	100
92nd day ...	2	4	2	½	4	4½	
93rd ,, ...	2	3	2	1	4	4	
94th ,, ...	2	4	2	1	4	5	
95th ,, ...	2	4	2	½	4	4½	
96th ,, ...	2	4	2	1	4	5	
97th ,, ...	2	4	2	0	4	4	
98th ,, ...	2	5	2	1	4	6	
14th week ...	17	4	14	5	32	1	96
99th day ...	2	5	2	1	4	6	
100th ,, ...	2	5	2	0	4	5	
101st ,, ...	2	1	2	0	4	1	
102nd ,, ...	2	2	2	1	4	3	
103rd ,, ...	2	½	2	½	4	1	
104th ,, ...	2	1	2	1	4	2	
105th ,, ...	2	2	2	1½	4	3½	
15th week ...	16	½	14	5	30	5½	92
106th day ...	2	3	2	1	4	4	
107th ,, ...	2	1½	2	1	4	2½	
108th ,, ...	2	2	2	½	4	2½	
109th ,, ...	2	1½	2	0	4	1½	
110th ,, ...	2	3	2	0	4	3	
111th ,, ...	2	3	2	½	4	3½	
112th ,, ...	2	3	2	0	4	3	
16th week ...	16	1	14	3	30	4	92
113th day ...	2	2	2	1	4	3	
114th ,, ...	2	3	2	1	4	4	
115th ,, ...	2	3	2	0	4	3	
116th ,, ...	2	3	2	1	4	4	
117th ,, ...	2	3	2	0	4	3	
118th ,, ...	2	3	2	1½	4	4½	
119th ,, ...	2	3	2	0	4	3	
17th week ...	16	4	14	4½	31	½	93
120th day ...	2	2	2	1	4	3	
121st ,, ...	2	3	2	0	4	3	
122nd ,, ...	2	2	2	1	4	3	
123rd ,, ...	2	3	2	½	4	3½	
124th ,, ...	2	2	2	1	4	3	
125th ,, ...	2	3	2	1	4	4	
126th ,, ...	2	3	2	½	4	3½	
18th week ...	16	2	14	5	30	7	93

—	Morning. Mrs.	Morning. Olks.	Evening. Mrs.	Evening. Olks.	Total. Mrs.	Total. Olks	Total. Pints.
127th day...	2	3	2	1	4	4	
128th ,, ...	2	3	2	1	4	4	
129th ,, ...	2	4	2	½	4	4½	
130th ,, ...	2	3	2	1	4	4	
131st ,, ...	2	3	2	1	4	4	
132nd ,, ...	2	3	2	1	4	4	
133rd ,, ...	2	3	2	1	4	4	
19th week ...	16	6	14	6½	31	4½	95
134th day...	2	2	2	0	4	2	
135th ,, ...	2	2	2	0	4	2	
136th ,, ...	2	2	2	1	4	3	
137th ,, ...	2	2	2	0	4	2	
138th ,, ...	2	2	2	0	4	2	
139th ,, ...	2	2	2	0	4	2	
140th ,, ...	2	2	1	7½	4	1½	
20th week ...	15	6	14	½	29	6½	89
141st day...	2	0	2	0	4	0	
142nd ,, ...	2	1	2	0	4	1	
143rd ,, ...	2	1	2	0	4	1	
144th ,, ...	2	1	2	0	4	1	
145th ,, ...	2	0	2	0	4	0	
146th ,, ...	2	0	2	0	4	0	
147th ,, ...	2	1	2	0	4	1	
21st week ...	14	4	14	0	28	4	86
148th day...	2	1	2	0	4	1	
149th ,, ...	2	1	2	0	4	1	
150th ,, ...	2	1	1	7	4	0	
151st ,, ...	2	1	1	6	3	7	
152nd ,, ...	2	1	1	6	3	7	
153rd ,, ...	2	0	1	6	3	6	
154th ,, ...	1	7	1	6	3	5	
22nd week ...	14	4	12	7	27	3	82
155th day...	2	0	1	7	3	7	
156th ,, ...	2	1	1	6	3	7	
157th ,, ...	2	1	1	6	3	7	
158th ,, ...	1	0	1	6	2	6	
159th ,, ...	2	2	1	6	4	0	
160th ,, ...	2	1	1	6	3	7	
161st ,, ...	2	0	1	6	3	6	
23rd week ...	13	5	12	3	26	0	78
162nd day...	1	7	1	6	3	5	
163rd ,, ...	2	2	1	5	3	7	
164th ,, ...	2	1	1	5	3	6	
165th ,, ...	2	1	1	5	3	6	
166th ,, ...	2	0	1	6	3	6	
167th ,, ...	2	0	1	4	3	4	
168th ,, ...	2	0	1	5	3	5	
24th week ...	14	3	11	4	25	7	78

In these records a measure is calculated to be equal to three imperial pints ; fractions of a pint are omitted unless over a half, which is calculated as one pint ; the exact contents of a standard measure is 104 cubic inches, while an imperial pint contains 34·659 cubic inches.

66. The following statement exhibits the quantity of milk yielded by the cow in each of the months over which the experiment extended :—

	MRS.	OLKS.	PINTS.		MRS.	OLKS.	PINTS.
1st week	46	0	138	13th week...	33	2	100
2nd ,, ...	44	5	134	14th ,, ...	32	1	96
3rd ,, ...	41	7	126	15th ,, ...	30	5½	92
4th ,, ...	42	3½	127	16th ,, ...	30	4	92
Yield in 1st month ...	174	7½	525	Yield in 4th month ...	126	4½	380
5th week	45	0	135	17th week...	31	½	93
6th ,, ...	40	1	120	18th ,, ...	30	7	93
7th ,, ...	30	3½	91	19th ,, ...	31	4½	95
8th ,, ...	31	3	94	20th ,, ...	29	6½	89
Yield in 2nd month ...	146	7½	440	Yield in 5th month ...	123	2½	370
9th week	31	3½	94	21st week...	28	4	86
10th ,, ...	30	3	91	22nd ,, ...	27	3	82
11th ,, ...	30	½	90	23rd ,, ...	26	0	78
12th ,, ...	28	3	85	24th ,, ...	25	7	78
Yield in 3rd month ...	120	2	360	Yield in 6th month ...	107	6	324

67. The total quantity of milk yielded during the six months was 799 measures and 6 ollocks or 2,399 imperial pints. The prices paid for the food, &c., of the cow during the experiment were as follows:—ground-nut cake 65 lbs. per rupee, bran 32 lbs. per rupee, green fodder 300 lbs. per rupee, straw for bedding, salt, &c., 1 rupee per month, and attendance Rupees 3 per month (the man having other duties to perform). The total cost incurred during the six months was—

	RS.	A.	P.
168 days, green fodder at 40 lbs. daily	22	6	5
168 ,, ground-nut cake at 4 lbs. daily	10	5	5
168 ,, bran at 2 lbs. daily	10	8	0
Straw and salt	6	0	0
Attendance	18	0	0
Total...	67	3	10

If from this amount we deduct Rupees 15, the value of the calf at six months old, there remains Rupees 52-3-10 as the cost of the 799 measures and 6 ollocks of milk or, say, in round numbers, 800 measures for Rupees 52 equal to one anna per measure ; it should, however, be remembered that the yield of milk will gradually continue to diminish until the cow again calves, and, as the cost of maintaining the cow up to that period will not be less than when in full milk, the cost of the milk will be proportionally increased, but throughout the year the milk will not cost 2 annas per measure. As in the larger towns of Southern India, milk of very inferior quality sells readily for 3 annas per measure ; it will be seen that in dairying a *very* profitable business could be established, and one well worthy of the attention of the "Poor Whites" of this country, regarding whom of late we have heard so much. But a dairy to be successful must command the confidence of the public.

68. It will be observed that the return for the 7th week is 25 per cent. less than the yield of the previous week ; this sudden diminution was due to the cow having been milked by a person

to whom she was unaccustomed, the man who always milked her being absent from sickness ; this change proved very unfortunate, for though, when the regular milker returned to his duties in the 13th week, the yield somewhat improved, it was still very much below what it would have been had the change referred to not occurred. I think it necessary to call particular attention to the facts just stated, for, though some cows will give the same quantity of milk to any milker, it is well that it should be known that with some cows a change in their attendant may lead to a very large reduction in the quantity of milk obtained.

69. During the first four months of the experiment the calf was allowed to take daily about one measure of milk, and about half a measure daily during the other two months ; this milk was, of course not brought to account in the foregoing registrations ; I think it an advantage in this country to allow the calf access to its mother before and after milking as is customary in this part of India, not only does the cow yield her milk more freely, but what is of more importance her udder is thoroughly stripped after each milking ; and, with the help of other food the calf can be reared at a very moderate cost. The first calf of the cow referred to was reared in this manner until about a-year old, when it was fed on food similar to that given to its mother ; it was always in good condition, and will calve at three years old, fully a year earlier than it is usual for heifers to calve in this country.

70. I attach very great importance to this experiment ; there is not, as far as I am aware, any published record of any similar experiment made in this country excepting that detailed in my report for 1872 ; and, before we can attempt to do anything to improve the dairy stock of the country, which so greatly needs attention, we must have reliable data for the guidance of our efforts.

71. *Sheep.*—I regret exceedingly to state that the opinion I expressed in my last report regarding the probable effects of the Madras climate on the health of the sheep imported from China has proved correct. At the close of the year the only sheep left of this breed were one ram, one ram lamb, and two gimmer lambs, and I fear that neither of the rams will be of any use. Great care was taken of the sheep, but they never throve in a satisfactory way after the commencement of the hot season.

72. The result of the experiment is unfortunate, as the breed possesses many valuable qualities, some of which, it is desirable, should be stamped on the sheep of Southern India ; amongst these characteristics are great length and depth of frame and ribs remarkably well arched, a fair yield of wool—very fine and lustrous—and great prolificness in the ewes.

73. It will be observed that all the sheep imported have died with the exception of one ram. Two of the ewes were in lamb when they arrived in Madras ; one of these a month afterwards gave birth to three lambs, but died on the day following, when it was ascertained that there was a dead lamb in the womb ; the other ewe shortly afterwards produced two fine lambs. It is a rare occurrence for ewes of the indigenous breeds found in Southern India to give birth to more than one lamb at a time ; though the Sydapet flock has in some years contained as many as 150 ewes, I have never, in a single lambing season, known more than two or three cases to occur of births of twins. As I have before had occasion to observe, it is very undesirable that anything should be done to increase indiscriminately the prolificness of the ewes kept by Ryots in Southern India until some better means are in existence for providing the ewes with food until their lambs are able to take care of themselves ; under usual circumstances it is now in most districts, in ordinary seasons, as much as the ewes can do to secure food for their own support, their single lambs, from unsuitable and insufficient food, growing up into animals that seldom pay for the food they consume when put up to fatten for the butcher. But if it is undesirable to increase indiscriminately the lamb-producing abilities of our ewes, there is no reason why this improvement should not be attempted with sheep in a few favored localities, and I would strongly recommend a further importation of Chinese sheep for use in experiments in such districts.

74. There is, I fear, now but little probability that we will be able to meet with a breed of sheep suited for use in improving the Sydapet breed, for all the breeds with which I am acquainted that possess superior qualities such as it is desirable to stamp on the Sydapet breed are quite unable to withstand the ill effects of the Madras climate, and it would be exceedingly unfortunate if, in attempting to add any new quality to those possessed by sheep of the Sydapet breed, they should be rendered less hardy and less able to encounter the effects of a high temperature.

75. The following details regarding the management of the Sydapet flock will supply the information for which I am frequently asked. All rams are kept entirely separate from the ewes ; after being weaned, the ram lambs are reared in pens and are only occasionally allowed to graze ; their food consists of green fodder and ground-nut cake. I should much prefer that these sheep should be grazed more frequently instead of them being so much confined in pens, but it is so extremely difficult to keep the rams apart from the ewes when both flocks are grazing, however I intend forming a grass paddock wherein the rams can be secured and in which they can obtain food and regular exercise during certain hours of each day. The rams are not used until they are about two and-a-half years old, at which age a good specimen will weigh from 100 to 120 lbs. live weight. The ewe flock is generally sorted over once a-year, and those of a bad form or color or with inferior wool, as well as those that have lost some of their teeth, are taken out of the flock and put aside for fattening. In September the ewes that remain in the flock are, with a number of gimmers then about eighteen months old, put to the ram ; about forty ewes are placed with one ram the breast of which is colored to mark the ewes in a way that enables the shepherd to detect readily those ewes that have been served, which he removes from the flock. The lambs are born about five months after, generally about 90 per cent. of the ewes proving in lamb. The ewes when about to lamb are placed in pens, three or four in each, where they are kept until their lambs are about three weeks old, after which they are again put into the flock in the sheepfold. All males that do not promise to turn out well are, when about six weeks old, made into wethers. When about three months old the lambs are removed from their mothers and are weaned, about a fortnight's separation sufficing for this, after which the wether and gimmer lambs are grazed in the flock with the ewes, the ram lambs being placed by themselves as previously noticed. All the sheep are generally clipped in April, which, I find, is the best month in the year for the purpose. When the ewes are being clipped, it is usual to mark the lambs in a way to render their identification easy ; in the farm flock this is done by cutting a small hole by means of an ear-pincer in the cartilage of one ear of each. During the season of the year when night dews are heavy the sheep do not leave the fold in the morning until the sun has removed the greatest part of the dew ; it was found when the sheep were turned out too early in the morning to feed upon grass heavily covered by dew that a number of them were invariably attacked by dysentery of a severe type. During the hottest part of the day the sheep return to the fold for a few hours, and again go to graze until about five in the evening, when they again return and receive about half a pound of ground-nut cake per head, and are shut up in the fold for the night. During very dry weather they receive, in addition to the cake, a small quantity of green food, but they are maintained chifley by the food they gather when out grazing. The sheep thus fed are kept in a thriving condition ; they are, of course, not fit for the butcher, but they are generally in the condition that it is most desirable for breeding stock to be. I have tried various months in the year in which to put the ewes with the ram. Under the impression that lambs born in December would thrive best from the abundant grass at that season available, I put the ewes with the ram in July, but the result of the experiment was disastrous, as a very large proportion of the lambs died, evidently, I think, from their mother's milk being unfitted for them, the result of the too liberal consumption of immature hastily-grown grass. Next year the lambing season was postponed a fortnight, and the result was fewer deaths amongst the lambs. From this time the lambing season was each year made later until it fell in the middle of February, at which time of year it

was found that fewest deaths occurred amongst the lambs, the death-rate having sunk from at the least 20 per cent. down to at the outside 5 per cent. This experience may be useful to owners of flocks; it was only recently that I was consulted regarding the management of a flock the lambs of which every lambing season died in great numbers; on inquiry, I was informed that each year's lambs generally fell about a month after the close of the monsoon rains, and to this fact I attributed the great mortality. Whenever ewes are suckling their lambs, and are feeding on the hastily-grown grass produced by the monsoon, loss amongst the lambs will be inevitable; I am convinced that the only way to avoid great mortality amongst lambs in Southern India is to arrange for their birth to occur after the sun has had time to harden the monsoon grass, and remove its pernicious qualities.

76. *Pigs.*—In my last report I referred to some Chinese pigs that had recently been received at this farm. Though every care was taken of them they never thrived, and have all died with the exception of one boar, which will not, I think, long survive the others, it is now in such a very feeble state of health. Besides this, there were at the close of the year four young pure-bred Chinese pigs, and a sow of the farm breed, which was served by the Chinese boar, is shortly expected to litter. It will thus be seen that the experiment, as far as it has yet proceeded, does not promise to yield very encouraging results; however, should it so happen that all the pure-bred animals should die, which is not improbable judging from our recent experience, we will, I think, make sure of some good resulting from the importation, in the half-bred pigs shortly expected. These Chinese pigs were not imported in order that they might be maintained as a pure breed; the intention was to cross them with the breed already at the farm in order that this breed might be stamped with some of the qualities which the Chinese breed possesses.

77. The pigs we imported from China were not of the quality I had anticipated from reading the eulogiums passed on the breed by English agriculturists, who wrote in the beginning of the present century, when the Chinese pig was attracting so much attention in England; and, if the pigs received are fair representatives of the breed now found in China, the English pig-breeders are now far in advance of the Chinese in the quality of the animals they now raise.

78. The Chinese have long devoted much care to the breeding and rearing of pigs, pork forming so large a proportion of the food of these people. It is said that Chinese pigs are very prolific, that they fatten rapidly on a very moderate allowance of food, and that their flesh is excellent, but they are not considered a hardy breed.

79. It may not be generally known that most of the best breeds of pigs now found in England and in France owe many of their most valuable qualities to the Chinese pig, which about 70 or 80 years ago was imported largely into England and France, and used for improving the indigenous breeds which were then very coarse and inferior, and widely different in every way to the pigs now found in these countries.

80. *Poultry.*—Arrangements have been made for procuring from Sydney a number of poultry of the best English breeds consisting of Brahma and Dorking fowls and Aylesbury ducks. When these arrive in Madras, they will be sent to this Farm, where they will be kept for raising stock for distribution over the country in view to improve the indigenous breeds of poultry.

81. Heretofore, with the exception of the birds of the Brahma-Dorking breed which were given to the people of the Wudder Settlement at Sydapet, it has been usual to charge the full value for all poultry obtained from this farm, but I trust that it will be found possible to extend largely the practice followed in the case of the Wudders and to distribute male birds of improved breeds gratuitously to the headmen of villages under certain conditions. I believe that in this way a great amount of good can be done at a very moderate cost; it is true that in many localities from the absence of natural food during a considerable period in the year, and the neglect of the people in providing proper food, superior breeds of poultry would degenerate, but there are

many localities in which natural food is abundant throughout the greater part of the year that might be selected for the experiments I have suggested.

82. I sent to Sydney for the poultry, because the former lot I received from there, proved so very satisfactory; I have not made any experiments in getting out poultry direct from England, but I am acquainted with the results of many such experiments from which it appears that there is generally a great loss of life during transit from England, and that the birds which survive the voyage are seldom able to encounter the great heat of the Madras climate.

83. The *American Agriculturist* of September last drew attention to some ducks which had just been landed in New York of a breed that had previously been unknown in America or Europe. These ducks had been brought from Shanghai, where they had been hatched from eggs obtained in the city of Pekin. The account stated that from their size the ducks were in appearance very like small geese; it stated that they were very uniform in size, and that a pair, only four months old, weighed 12 lbs. From this description, I was induced to enter into correspondence with Messrs. Arbuthnot and Co. of Madras in view to obtaining some specimens of this apparently valuable breed; these gentlemen very kindly arranged with Messrs. Matheson, Jardine and Co., of Hong Kong, to procure in Pekin and send to Madras a number of pairs of these ducks; if these prove to be at all equal to the description given of the breed in the American Newspaper, the ducks will be a valuable introduction here. Our indigenous breeds are very poor, while the facilities for rearing ducks are great in most parts of the Presidency.

Crops.

84. *Field experiments.*—Several series of experiments with manures of different kinds, applied in different quantities, were commenced at the beginning of the last cultivating season; but, owing to the absence of seasonable rains after the crops were sown, most of these experiments had to be abandoned, and the crops that were partially successful were valueless in affording information regarding the comparative values of the manures used; these results were especially unfortunate, seeing that in the previous year the weather was also unpropitious for field experiments. It is highly desirable that we should devote great attention to field experiments; there is so much to be learned regarding the peculiarities of the various crops we grow, and the effect on them of dressings in various proportions of the different manures available in Southern India. Not only are these experiments very costly in the amount of labor and supervision they absorb, but as they must be made at the season of the year, when the ordinary cropping of the Farm requires all the attention and labor that can be devoted to it, they are exceedingly troublesome; however, I should not grudge the expenditure these experiments cause of time and money, if we could but insure that even a very small proportion of them would meet with the conditions necessary to give a practical value to the information they yield. It is very discouraging to see so much labor wasted when a drought causes an experiment to be abandoned.

85. At present on the Experimental Farm, owing to the absence of means for irrigating the land, we have no alternative but to begin our field experiments shortly before the time the rains of the north-east monsoon are due, when the weather is always very irregular and uncertain. Of course, field experiments never can be conducted with that scientific exactitude that is desirable, but the conditions under which they are placed should as far as possible be under control; and to obtain this, it is necessary that they should be instituted at the season of the year when the weather may be expected to be calm or somewhat uniform in character. I have found at Sydapet that only one out of every two or three monsoon seasons is at all favorable for the carrying out of comparative experiments in the field with different manures. The best time at which to begin such experiments would be about the middle of November, when in an ordinary season the heaviest burst of the monsoon will be over; there are, however, but few of our crops, that when sown so late would reach maturity unless irrigated, and this unfortunately we cannot do except on a very limited scale. It is very desirable that the channel to be made for supplying the Sydapet Farms with irrigation

water should be made with the least possible delay, not only that the field experiments may be conducted with more certainty of their reaching completion, but also to afford the means for carrying out the many field experiments that must be instituted for educational purposes on the Establishment of the School of Agriculture.

86. *Seed-sowing.*—The following experiment was made in order to ascertain the most suitable depth at which to sow maize and cotton. Fifty grains of each kind of seed were carefully sown at depths varying from 1 inch, to 5 inches. The soil was kept in a moist condition during the time the experiment was proceeding :—

New Orleans Cotton.

When counted.	Sown 1 inch deep.	Sown 2 inches deep.	Sown 3 inches deep.	Sown 4 inches deep.	Sown 5 inches deep.
	Number of plants that appeared above ground.				
1st day... ...	...	...	...	...	...
2nd ,, ...	...	...	...	...	...
3rd ,, ...	...	...	...	...	...
4th ,, ...	...	...	...	...	...
5th ,, ...	15	...	...	...	...
6th ,, ...	32	8	1	...	...
7th ,, ...	33	12	5	...	...
8th ,, ...	33	17	8	...	...
9th ,, ...	33	17	8	...	...

The seeds sown at 1 inch in depth produced 33 plants, or 66 plants for each 100 seeds, and the whole of these plants had appeared before the close of the seventh day after sowing ; the seeds sown at 2 inches gave a return of only 34 plants for each 100 seeds ; and the whole of these plants did not appear until the eighth day after sowing. The seeds deposited at 3 inches in depth produced only 16 plants for each 100 seeds, and these were not all above ground until the eighth day. It will be seen that no plants were produced from the seeds sown at 4 inches and at 5 inches.

Maize.

When counted.	Sown 1 inch deep.	Sown 2 inches deep.	Sown 3 inches deep.	Sown 4 inches deep.	Sown 5 inches deep.
	Number of plants that appeared above ground.				
1st day... ...	...	...	...	...	...
2nd ,, ...	...	...	...	...	...
3rd ,, ...	...	...	...	...	...
4th ,, ...	...	...	...	...	...
5th ,, ...	10	...	...	...	...
6th ,, ...	27	4	...	...	...
7th ,, ...	38	6	...	...	...
8th ,, ...	39	13	4	...	...
9th ,, ...	40	16	9	...	...

The 50 grains of maize sown at 1 inch produced 40 plants. The same quantity of seed sown at 2 inches produced only 16 plants ; a similar quantity sown at 3 inches in depth yielded only 13 plants. It will be observed that the maize plants, like the cotton appeared much more quickly when the seed was lightly covered by soil.

87. From these experiments it would appear that shallow-sown seeds of the kinds experimented with not only germinate much more quickly, but produce a great many more plants than seed that is buried more deeply in the soil; but it must not be inferred from this that shallow sowing is more likely to produce good results than deep sowing, for the information above given is only a portion of that the experiment is expected to yield; we have yet to ascertain whether the more rapid first growth of the plants produced from shallow-sown grain is supported by an equally-luxuriant root-growth upon which the ability of the plant to withstand the illeffects of a long drought so greatly depends. I am inclined to think that with such large seeds as maize and cotton, 1 inch is too shallow a depth at which to sow them, and, in practice, I seldom sow these seeds at less than 2 inches in depth; but then this is only upon deeply-cultivated and well-pulverised soil, whereas the soil used in the experiment resembled in its physical condition the soils of the Ryot. I believe that the more deeply the seed can be sown in the soil with due regard to its germinative powers the more certain will the plants produced from it reach maturity; but to ensure the proper germination of deeply-sown seed, it is absolutely necessary that the soil in which it is sown should be in a high state of cultivation in order to admit of rain water filtering freely through it, and in its way carrying down atmospheric air to the buried seed. It must be remembered that germination cannot take place except under the influence of air, heat, and moisture; seed that is too deeply buried in a close badly-cultivated soil will altogether fail to germinate. The experiment, as far as it has proceeded, shows how important it is, in order to secure a uniform growth of young plants, that the seed should be doposited at a uniform depth in the soil. I need scarcely point out how necessary it is, in order to secure the best results at harvest from every individual plant, that we should, as far as possible, bring all the plants in a crop to maturity at one time, which can be secured only by regular sowing. Badly or unevenly sown seed must, as the experiment shows, produce plants of great unevenness in growth, these at harvest will mature at very different times, leaving the Farmer no choice but either to wait for the backward plants, and thus lose seed by the shedding of the too ripened grain, or, cut down the whole when the first plants reach maturity, and sacrifice the produce of those not yet matured. I hope in my next report to be able to state the further results of the experiment just noticed.

88. *Carolina Rice.*—The following particulars, respecting two samples of country-raised Carolina rice, which Messrs. Walker and Co. of Madras very kindly forwarded to England on my behalf, may possess some interest.

89. Parcel A was prepared from 8 Madras measures of Carolina paddy and consisted of 3¾ Madras measures of clean rice. Messrs. Walker and Co. were good enough to have the paddy husked in the same way that it is usual in Madras to husk all paddy intended for export to England The 8 measures of paddy yielded as follows :—

	By volume. Per cent.
Clean rice fit for the Home Market	46·87
Broken rice	3·13
Husk and wastage	50·00
	100·

With reference to this result, Messrs. Walker and Co., wrote to me: "We are not very well satisfied as to the result of the husking, the grains are more broken than is desirable, but the coolies say they found it more difficult to husk the paddy than the ordinary native grain." With reference to the cost of husking, they wrote: "The cost of husking the 8 measures is 1 anna, and we can contract at this rate for all you intend sending to England. In the same letter they remarked, "the wastage on this 8 measures may be taken as a fair average."

90. Parcel (B) consisted of 623 pounds of cleaned rice prepared from 448 Madras measures of country-raised Carolina paddy. In addition to the clean rice there were 24¾ measures of broken rice, the value of which was in Madras one anna per measure.

91. The following letter refers to parcel B :—

Dear Sir,

We now wait on you with our Broker's report and valuation on the four bags of rice sent to London on your account by S. S. *Sultan*, and we trust the report will be considered satisfactory. We may mention that while your rice is valued at 10*s*. 4½*d*. to 10*s*. 6*d*. per cwt., *ordinary* "Pinky" was sold at 9*s*. 6*d* to 10*s*. 7½*d*. for *good*.

(Signed) WALKER, AND CO.,

Broker's report on four bags ◇ G. F. W. & Co. R. of rice per *Sultan*.

"The rice proves to be very fine white grain, and, in quantity, would command 10*s* 4½*d* to 10*s*. 6*d* ; it is different from what is known as "Pinky," and we doubt if the Starch-makers, who are the largest consumers of this particular sort, would like it so well ; but for cleaning purposes, it would meet a ready sale."

92. The rice was sold in London in the usual way ; the price realized, 11*s*. 6*d*. per cwt., was only a trifle higher than the price ruling at the time for ordinary Madras rice. This result was somewhat disappointing ; judging from the value generally put upon Carolina rice in London, I had anticipated a much larger price than was obtained.

93. It is, I think, probable that the very high price that Carolina rice, imported from America, commands in England is due chiefly to the very superior way in which it is prepared for market. The Madras grown Carolina paddy, from which the rice (Parcel B.) was prepared, was, as far as I can judge, quite equal in quality to the Carolina paddy which was imported into this country from America, and which was the seed from which the paddy in question was raised. I cannot offer any opinion as regards the appearance of the sample of the Madras prepared Carolina rice, in comparison with the appearance of the rice prepared under the milling processes usually followed in America ; but I can readily believe, from what I know of the processes followed in this country and in America in preparing rice for market, that the appearance of the American rice must be very greatly superior to the appearance of that prepared in Madras. In Madras, the husk merely is removed ; there is no attempt to remove the dark-colored surface which is found immediately beneath, and very little is attempted in the way of sizing the grain ; the whole process, such as it is, being performed by women by means of a pestle and mortar and a bamboo sieve. The following extract from a report published by the Department of Agriculture in the United States of America shows the process under which the Carolina rice of that country is prepared :—

"The rough rice is first ground between very heavy stones running at a high speed, which partially removes the rough integument or hull chaff. This chaff is passed out of the building by spouts, and the grain by similar means conveyed into the mortars, where it is beat or pounded for a certain length of time by the alternate rising and falling of very heavy pestles shod with iron. These are operated by a revolving cylinder of huge dimensions armed with powerful levers, which passing into a long opening in the pestle, about 15 feet in length, raise it in mid-air and let it fall suddenly into the great mortars below. From the mortars elevators take the rice to the fans, which separate the grain from the debris. From thence it goes through other fans that divide it into three qualities, known as "whole," "middling," and "small rice." The grain is lastly passed through a polishing screen lined with gauze wire and sheep-skins, which, revolving vertically at the greatest possible velocity, embellishes it with that pearly whiteness in which it appears in commerce." I need scarcely

remark that this great nicety in the preparation adds nothing to the food-value of the rice. Indeed, I believe that in the attempt to get a very white-colored rice, a large quantity of valuable human food is lost, as the portion of the seed immediately below the husk or outer skin contains the largest proportion of nutritious matters. It may be well enough to prepare rice for the London market in the way it is usually prepared in America ; in England, there is always a demand at high prices amongst the luxurious and wealthy for produce either exceptionally good or exceptionally well prepared, and as rice forms but an exceedingly small proportion of the food eaten by Englishmen, the loss of nutritive matters by the unnecessary refinement of the process under which the rice is prepared is of little moment. The case is widely different in a country like this, with a people subsisting so largely on rice ; in their case the loss of even a very small quantity of nitrogenized matter by a greater refinement in the preparation of their rice would be a very serious loss indeed. In England, the intrinsic value of rice as human food enters but little into the commercial value set upon it ; the points of excellence specially demanded are, uniformity in size and color which must be a pearly white, matters of but small importance to rice-consumers in this country. If these views are correct, there is at present not much to induce the Cultivators of this country to grow Carolina paddy on an extensive scale for the Home market, for, not only must they produce a first-class sample of paddy, but there must be at work the agencies required to convert that paddy into the superior quality of rice required. In its superior productiveness, its superior quality, its less aquatic habits and other qualities to which I have alluded in former reports, Carolina paddy possesses many advantages over our indigenous varieties of paddy ; but, I fear, it is hopeless to expect to secure from Madras raised Carolina rice the high price that American raised Carolina rice commands in London, until we can prepare rice for market in a way equally as good.

94. *Wheat.*—Several small plots were sown with wheat ; some with seed obtained from the Neilgherries, and others with seed produced in the Coimbatore District ; the sowings were made at different dates, between the 1st of January and the middle of March. The seed from both districts germinated well, and produced vigorous and healthy plants ; however, only a very small proportion of them succeeded in maturing any grain, the result evidently of the high temperature that prevailed during the latter half of their growth. I think that, had the sowings been made not later than the middle of November, in order to secure the harvest in January, the result would have been very different. The plants up to the time they began to flower were very healthy and strong. The experimental plots were all thoroughly cultivated and liberally manured, and irrigation water was applied when necessary. I intend to make further experiments with wheat on the Sydapet Farms, if we are successful in meeting with a variety that can be grown generally over the plains of Southern India, wheat cultivation might be considerably extended. An average crop of wheat will yield a much larger quantity of human food than an average crop of paddy, while a supply of water that would but just suffice to mature one acre of paddy would be ample to meet the requirements of two or three acres of wheat.

95. *Maize.*—A plot of land measuring 1,950 square yards was, on the 15th of January, sown with 14½lbs. of maize seed. The soil was a free sandy loam ; it was twice ploughed, twice harrowed, manured with 1,500 lbs. of oil cake and fourteen cart-loads of ashes, and ridged. During the growth of the crop the land was five times irrigated and once hand-hoed. The plants grew so luxuriantly, it was found necessary to thin out a considerable number ; the weight of fodder thus obtained was 1,134 pounds. The remainder of the plants matured three months after sowing, and produced 1,738 cobs and 1,324 pounds of dry straw. The cobs were small from the plants having been too crowded on the ground. The experiment is worthy of notice, because the sowing was made out of the usual season, September being the usual seed time for maize ; and, also, on account of the crop having been occasionally watered instead of treated as a dry crop. If we can succeed in producing as good crops of maize, with the aid of occasional irrigation, from sowings made just after the monsoon as we can produce from sowings made in the usual season, the

change will be well worth adopting, as maize from its tall, upright growth is especially liable to injury from the effects of high winds which generally prevail during the monsoon.

96. *Yellow Cholum (Sorghum vulgare).*—I have frequently drawn attention to this valuable fodder-crop, and I would again do so, as its value is yet but little appreciated by those who might benefit most largely by cultivating it. Most of the live-stock on the Sydapet Farms are fed on cholum fodder throughout a greater part of the year; the crop is therefore cultivated on these Farms on rather an extensive scale. The following details refer to a crop which was produced on a plot of ground, measuring 2,494 square yards. The soil was a stiffish loam; before being sown it was prepared in the following way: once ploughed, once harrowed and ridged; then manured with ten cart-loads of farm-yard manure, and again ridged over the manure; the ridges thus formed being about 24 inches apart. The seed was sown on these ridges on the 2nd of June; it germinated well and produced strong and healthy plants. The crop during its growth was hoed by hand twice, and was sixteen times irrigated. The crop, three months after sowing, was cut down for use as fodder, when its total weight was found to be 4 tons 10 cwts. and 50 lbs., equal to 8 tons 15 cwts. 59 lbs. per acre, a quantity sufficient to support two ordinary milch cows during a year.

97. We have occasionally produced much heavier crops than this: thus, the plants growing on 75 square yards of a plot sown with yellow cholum were found to weigh 664 lbs., which is equal to a yield of 19 tons 2 cwts. and 66 pounds per acre. This large yield was obtained only on a portion of the ground, the remainder of the crop not being so good; but the result shows what it is possible to achieve in the production of cholum fodder. This large return was obtained from plants only nine weeks old.

98. *Jute (Corchorus Olitorious).*—Several experiments were made in the past year in the cultivation of jute with seed obtained from Bengal. The soil of most of the experimental plots was a free sandy loam. Manure was applied in each instance generally at the rate of about ten cart-loads per acre. The soil was thoroughly worked and cleaned; in some cases it was ridged. The sowing of the different plots was done in different months, some were sown in June, others in July, in August, and in October. The seed was always sown in lines either on the ridge, or on the flat. The distances between these lines varied in the different plots; in some instances the intervals between the lines were 12 inches, while in others they were as much as 2 feet. The quantity of seed sown in the lines also varied in the different experiments. The seed in every instance germinated well, and there was generally a good covering of healthy plants before the expiration of the first fortnight after sowing, but, when about a month or five weeks old the plants began to flower and to throw out side branches, these latter grew with great vigor, and soon exceeded the main stems in size, as a rule, when the height of the plants was not more than 18 inches, these laterals measured from 2½ to 3 feet in length. The flowers on the lower portions of the plants had generally matured and produced seed by the time those on the higher branches had begun to appear. A few plots were planted with seedlings which had been removed from the more thickly-sown crops; these readily took root and grew with great vigor, but they, like the plants from the seeds sown at once in the field, flowered when only about one-third grown, and threw out a large number of side branches. Each experimental plot was hand-hoed and cultivated during the growth of the crop, and a few of the plots were occasionally irrigated.

99. One object of the cultivation was to produce seed for distribution, and in this respect a certain amount of success was achieved, about 150 pounds of seed having been collected; but I did not think it wise to distribute any of it, seeing that the plants from which it was gathered were so inferior in shape and in size. The general results of the experiments were in every instance unsatisfactory, whether the sowings were made during the hot weather or during the rains, whether the seed was sown thickly or thinly, in lines at narrow or wide intervals, or whether the crop was irrigated or watered only by rainfall.

100. It is possible that the seed obtained from Bengal may have been produced in a climate too widely different from that of Madras, but the plants produced from the Sydapet raised seed were in no respect superior to those produced from the Bengal seed. I am inclined to think that the climate of this part of Madras is too dry for jute, and that a climate better suited for its culture will be met with in the northern districts of the Presidency.

101. I made no use whatever of the plants, as I did not consider that the value of the fibre obtained would cover the cost of its preparation.

102. I hope to be able to continue these experiments with seed produced in the northern districts of this Presidency.

103. *Roselle* (*Hibiscus subdariffa*) ; *Sunn Hemp* (*Crotalaria juncea*).—A plot of land, measuring 1,210 square yards, was sown with roselle seed. The soil was a free sandy loam. It was prepared for the crop in the following way: twice ploughed, once harrowed and ridged; then manured with 3½ cart-loads of farm-yard manure, and again ridged over the manure; on the 1st of February six pounds of seed were sown on the ridge. During the growth of the crop, the land was once hand-hoed, once bullock-hoed, and eighteen times irrigated. The seed germinated well, and the plants grew with great vigor; they were straight and almost without side branches, and averaged between 5 and 6 feet in height when ready for cutting, about three months after sowing. As the crop was grown chiefly in view to the production of seed, the fibre of the plants was not utilized; a few plants were, however, cut down when in flower, in order to ascertain the quality of their fibre, the result was very satisfactory, for the fibre proved to be long in staple, strong, and silky.

104. Another plot of land of the same area as that sown with roselle seed was, on the 2nd of February, sown with 14 lbs. of sunn hemp seed. The treatment of the land was precisely similar to that of the land sown with roselle. It was also similarly manured; and the treatment of the crop during growth was also the same. The seed germinated well, and the plants grew with great luxuriance, but when they had reached the period for cutting, there was no fibre whatever in their stems. It is, I think, probable that by the liberal use of manure and water, the plants were caused to grow too rapidly for the proper development of their fibre.

105. From the results of these two experiments, it would appear that while high culture is very advantageous to the roselle plant, it has quite a contrary effect on sunn hemp as regards the production of fibre, at any rate on soils similar to those on which these experimental crops were grown.

106. *Guinea Grass.*—A plot of land, measuring 4·77 acres, was, on the 28th November last, planted with Guinea grass; the soil was a sandy loam of rather a stiffer character than the prevailing soils of this farm. After three ploughings, the land was manured with 4,000 lbs. of cotton seed, the vitality of which had been previously destroyed; the soil was then raised in parallel ridges about 9 inches in height and 2 feet apart; the plants were put in on these ridges at every 2 feet, care being taken that the lines they formed across the field were at right angles to the lines formed by the ridges, thus affording facilities for the employment of the plough during the growth of the crop, both between the ridges and across them. The plants, with which the ground was planted, were removed from tussacks of this grass growing in another field. A wet day was selected for planting, and nearly every plant took root. The following shows the cost of planting this field :—

	RS.	A.	P.
Ploughing three times and ridging	7	8	0
Four thousand pounds cotton seed	40	0	0
Carting and spreading manure...	2	4	0
Labor in planting	8	5	0
Carting plants to field	1	4	0
Total ...	59	5	0
Cost per acre ...	12	6	11

The field has since received one hoeing. No irrigation water whatever has been applied to the crop, either at the time of planting or subsequently. The rain-fall, as will be seen by the following, was during the past three months unusually light :—

Month.	Wet Days.	Inches.
November (from 28th)	1	3·38
December	5	5·11
January	1	0·10
February	—	—
March	1	0·77

The first cutting was obtained in February, and the yield was 3 tons and 56 lbs. ; another cutting was obtained in March, which weighed 2 tons and 20 lbs., and there was at the end of the month another crop of about the same weight ready for cutting. The experiment will be continued over another year, and the further results will be reported.

107. I have before recommended Guinea grass as being well suited for culture in the plains of this Presidency, and I would again strongly advise its extended cultivation. It will, I think, form an excellent rotation grass for arable land ; at present there is in the agriculture of this Presidency no crop equivalent to the fodder and root-crops of other countries, and this want Guinea grass promises to supply. Not only is the plant from its habit of growth, an entire change for the soil, but the system of cultivation pursued with it, admits of the soil being kept in a fine state of tilth ; while the blades of the grass form such a dense covering, weeds are most effectually kept in check, especially those that usually appear in the crops more commonly cultivated. Land which was kept clean with difficulty and at a great expense when under ordinary crops cost very little for weeding when under Guinea grass, this being due to its vigorous growth and to the low and close shade afforded by it, and to the facilities the system of culture affords for keeping down the weeds.

108. Guinea grass is well suited as a change-crop for land that has long been cultivated with one kind of crop only, and has become infested by certain kinds of weeds or insects such as that crop encourages.

109. Guinea grass can be cut over regularly for fodder, or it can be grazed by cattle and sheep ; for use in the latter way it is excellent, though in showery weather it is better to utilize it in the former way.

110. Under the system described, the land on which the crop is growing can be manured at any time, and, of course, the more liberally manure is used the better will be the results.

111. *Casuarina Tope.*—A piece of land, measuring 760 square yards, was, on the 5th of July last, planted with 173 casuarina seedlings, aged about 5 months. The dimensions of the pits were 18 inches in each direction ; they were made at about 6½ feet apart. A dressing of four cart-loads of farm-yard manure was distributed in the pits at the time of planting. The seedlings took root and grew rapidly ; they were five times watered between the time of planting and the close of the year under review. The following shows the cost incurred on this experiment up to the end of the year :—

	RS.	A.	P.
Digging pits and planting	3	12	0
Value of trees	1	8	0
Do. of manure	4	0	0
Watering	2	8	0
Pruning, &c.	1	0	0
Total ...	12	12	0

These trees have made a most extraordinary growth, their average height on the 1st of April being fully six feet. The further results of the experiment will be duly reported.

Manure.

112. *Loss to Agriculture from the Practice of using Cattle-dung as Fuel.*—It has been asserted with some degree of prominence by a would-be agricultural authority that it is a delusion to believe that Indian Agriculture suffers largely from the general use of cattle-dung as fuel, for the ashes made during the combustion of the dung are, as manure, quite as efficacious as the dung from which they were made. This is but an attempt to revive the old "mineral theory" which, about twenty-five years ago, was brought into considerable prominence by one or two Continental Chemists, who, though eminent in a knowledge of the results of researches conducted in the laboratory, were thoroughly ignorant regarding the processes of agriculture, and the bearing these had on the various physical agencies which aid the husbandman in his work. Agricultural chemistry was at that time but in its infancy, and it was not at all surprising, seeing what grand discoveries chemistry had already made in connection with agriculture, that Chemists should have rather over-estimated the aid they could afford to the Farmer. Amongst those who fell into this mistake was that eminent chemist Baron Leibeg, but he, in his later writings, fully repudiated the mineral theory as originally advocated by him, and brought his views into harmony with those of our English Chemists who had not confined their researches and observations to the narrow limits of the laboratory; there is, perhaps in the present day, not a single Chemist of any repute who would venture to assert that the fertility of land under regular cropping can be sustained by the use of mineral manures alone, that is, using the word "mineral" in the sense in which it was used in the original "mineral theory." The fact is that, even if we do return to our soils the *exact* kind and quantity of mineral foods found in the ashes of the different crops we produce, we will not succeed by these means alone in maintaining the fertility of our land. It would be as sensible to attempt to support a horse in good working condition on a daily pill containing the equivalent of the ash-constituents of a fair daily allowance of ordinary food, as to attempt to maintain the fertility of a soil by returning to it the *exact* quantity *only* of the ash constituents of the preceding crop. The fact is, bulk and dilution are, within certain limits, as essential for the utilization of a manure as of a food, and this is effected in the most perfect way possible by the organic combinations in which these minerals are generally met with in plants; hence, one reason of the superiority of farm-yard manure over ashes, though both may contain the same minerals and in the same proportion. But I have said enough on the "mineral theory;" the question is too large for discussion at greater length here, and the practice of the farmer in every civilized country has afforded ample evidence that the views now held by Agricultural Chemists regarding the original "mineral theory" are sound and accurate.

113. I believe that from the general use of cattle-dung as fuel in this country, our agriculture suffers most severely;—first, from the urine being always wasted when the solid excrements of cattle are collected for burning; second, from the entire destruction of those latent physical powers in the dung which, when it is used in the shape of farm-yard manure, come into operation and produce such beneficial effects on the physical state of a soil; third, from the loss of plant-food dissipated into the air during the combustion of the dung; and last, from so large a proportion of the ashes made being entirely wasted, and the fertilizing properties of the small proportion used as manure being in most instances seriously lessened by the careless way in which they are usually protected from rain during collection.

114. Of course, the fertilizing value of the urine of the ox will depend very greatly upon the nature of the food it consumes; but the following shows its approximate composition and, for comparison, that of the solid excrements also:—

——	Urine.	Dung.
Water	920	840
(*a*) Organic matter, urea, uric acid, &c.	60	135
(*b*) Inorganic matter, salts of potash, soda, &c.	20	25
Total ...	1,000	1,000
(*a*) Containing nitrogen capable of yielding ammonia	9·00	3·60
(*b*) Containing phosphoric acid	·70	2·25

115. It will be seen from this that the urine is very valuable; indeed, by many authorities it is considered the most valuable portion of the excrements of the ox; the loss to this country, then, from allowing this valuable fertilizing agent to run to waste to such a serious extent must be enormous.

116. It is a mistake to suppose that the fertilizing effects of farm-yard manure can be measured and determined by its composition as shown by analysis. Field experiments have proved over and over again, that one ton of farm-yard manure when applied to the soil will produce vastly greater effects than a dressing of a mineral manure containing the ash equivalents of the ton of manure; while the effect of the ashes on the physical state of the soil would be almost imperceptible, that produced by the farm-yard manure would be great and highly beneficial. In no country would the benefits that are conferred on a soil by an application of farm-yard manure be greater than in India, where famines so frequently result from a drought. The power of a soil to absorb moisture from the air, and to retain that moisture in a healthy condition, depends almost entirely upon the quantity and state of the organic matter that soil contains; but, with reference to this matter, I cannot do better than direct attention to the statements made by Dr. Voelcker, in a report printed in the last issue of the Journal of the Royal Agricultural Society of England on the analysis of seventy samples of drainage water collected by pipes, on the Rothamstead Experimental Farm, from plots which had each, for many years, been manured by one kind of manure only. Speaking of the plot that had continuously been manured with farm-yard manure, he says:—

"Notwithstanding the heavy and continuous rains which fell in December, and which caused the pipe-drains from all the other plots to run freely, little or no water passed through the drain-pipe from the plot usually manured with farm-yard manure, and, consequently, no analysis of the drainage from that plot could be made in December 1869. Dr. Gilbert informs me that whilst the pipe-drains from every one of the other plots (dressed with mineral manures) in the experimental wheat-field run freely, perhaps four or five times or more annually, the drain from the dunged plot seldom runs at all more than once a-year, and in some seasons not at all. The fact is the vast accumulation of decomposing organic matter on the plot, annually dunged at the rate of fourteen tons of farm-yard manure per acre, lightens the soil and promotes the disintegration of the clayey portions, and altogether renders the surface-soil more porous and capable of retaining much more water. Hence a much greater amount and continuity of rain is required before the porous surface is fully charged with rain, and an excess can reach the drains."

"This result is interesting and important, for it illustrates in a striking manner the beneficial effects of farm-yard manure on the soil in ameliorating its texture, and generally speaking, its mechanical or physical condition, in consequence of which the growing crops will suffer less during seasons of drought. Messrs. Lawes and Gilbert have found that the dunged soil, when saturated, retained within twelve inches of the surface an excess of water which would be equivalent to about $1\frac{1}{2}$ inches of rain more than that held to the same depth on the unmanured and the artificially 'mineral' manured plots in the same field, which fully explains the circumstance that during the five collections of drainage waters, samples from the dunged plot could be obtained only on two occasions."

117. The direct waste of plant-food by burning dung is great, as the whole of the organic matter which constitutes at least 85 per cent. of dry dung, and which contains amongst other valuable plant-food a large percentage of nitrogen, the most costly and most difficult to replace of all these foods, is dissipated into the air and lost.

118. One of the greatest difficulties with which our Municipalities and Village Authorities have to contend is, the great accumulation of ashes (cow-dung and wood) in our towns and villages; in some instances there having been no other alternative, but to use these ashes in filling holes and other inequalities in the ground.

119. I can always buy for the Sydapet Farms any quantity of ashes—⅓ cow-dung and ⅔ wood-ashes—at one anna per cart-load in the village. During the past year, I purchased about 5,600 parahs equal to 480 cubic yards, at 30 parahs or about 6 Annas per cubic yard delivered on any part of the Farm where they were required.

120. I can also purchase *pure* cow-dung ashes at 25 parahs per rupee delivered; now deducting the cart-hire for three cart-loads Annas 9, we have the value of the ashes in the village, *viz.*, 25 parahs for Annas 7, equal to about 3½ Annas per cubic yard, as it takes about 150 pounds of perfectly dry dung to yield one parah of ashes, we arrive at the fact that in the manufacture of one cubic yard of the ashes 1,725 lbs. of dry dung or about 3,000 lbs. of fresh dung must have been used; however, fresh dung is never employed as manure by itself, it is, in all civilized countries, collected with the litter used in bedding, which, also, contains the urine of the animal, and the mass collected forms what is called farm-yard manure. Now, if instead of the 3,000 lbs. of fresh dung having been collected separately for use as fuel, it had been made into farm-yard manure, the quantity would have amounted to certainly not less than 7,000 lbs., or about twelve country cart-loads. I am quite sure that every one who is in the least qualified to form an opinion on the matter will agree with me that the twelve cart-loads of farm-yard manure would produce, when applied to the soil, at the least four times the effect in increased crop returns, that would be obtained from the use in a similar way of the cubic yard of cow-dung ashes. Not only would the immediate effect be greater, but it would continue to act over a much longer period. Again, while the ashes might be washed out of the soil and carried away by the first downpour of rain after their application, the farm-yard manure in the soil could not be removed in this way.

121. If it was necessary to provide food to sustain the people of this country during the famine, if it is necessary to improve the sanitation of the country in order to prevent the outbreak and spread of epidemic diseases amongst the people, and by these means remove the checks which previously existed on the increase of population, surely it is equally necessary to take means to ensure that this increased population can obtain sufficient food. It is of little use endeavoring to remove those causes which tended to keep down the population, if the people thus preserved are to be rendered miserable throughout life from their having to subsist on a semi-starvation diet. The universal practice of burning cow-dung lessens materially the food-producing powers of the country, and the practice, in most instances, is most unjustifiable. Every Ryot can, at a trifling expense, and at little trouble to himself, produce on his land the fuel required for the use of his household. If every Renter of Government land was compelled to grow a certain quantity of fuel trees for each acre occupied, the benefit to the country would be immense in the course of a few years, as cattle-dung would then be set free for use in a legitimate way, and not only would the produce of the land now under cultivation be increased, but much of the land abandoned might again be brought under profitable cultivation.

122. Whether it is good economy on the part of the town-people of this country to use dry cow-dung in the form of bratties for fuel is altogether another question, but I venture to think that it is not good economy, seeing that the selling price of a ton of dry dung is, in most instances, in excess of the selling price of firewood, and, at the least, double the price at which firewood could be produced in the neighbourhood of towns.

123. The following experiment was made to ascertain the quantity of ashes that would be obtained from the dung of two bullocks, and the quantity of fold-yard manure that would be made by other two bullocks, treated alike, during two months. All the bullocks were about the same in age and size, they were all worked during the day, and confined in sheds at night; they were fed on dry straw and cake; the experiment extended over two months, during which there was a great drought and an enormous evaporation; the inside temperature during the time varied between 95 and 105 degrees, and the entire rainfall during the period only amounted to 00·93 inches. Each bullock was confined in a loose-box under cover; in two of

the boxes no litter was supplied, and the solid excrements were removed daily and made into bratties or cakes ; these, after being thoroughly dried, weighed 189 pounds, and, after burning, yielded 56½ pounds ashes. The cattle in the other two boxes were bedded with 364 pounds of litter; this litter absorbed the urine of the animals, and with it were mixed the whole of the solid excrements ; the manure, thus made, was found to weigh, at the termination of the experiment, 586 pounds ; the weight would have been very much greater had there been green food available for the animals, or, had the experiment been made during ordinary weather, instead of during a drought ; as, owing to the extreme dryness of the air, the litter, in the manure, contained very little more moisture than when it was first put into the loose-box, its increase in weight being due chiefly to the dry matter of the urine it had absorbed, and which, weight for weight, is much more valuable than the dry matter of the solid excrements. This is the first of a series of experiments of the kind intended to be made at different seasons of the year and under different conditions.

124. *The Fern.*—The species to which the following remarks refer is the *Pteris Aquilina* generally known as the *bracken*, which is found abundantly in many parts of the higher hill ranges of this Presidency. The bracken is used as a litter for cattle stalls, &c., very largely by Coffee Planters resident on the Neilgherris, in Wynaad and in Coorg ; for this purpose it is well suited where the straw of cereals is costly and difficult to obtain. It is much slower in decomposing than ordinary straw, and its stem being solid instead of hollow, it is in the fresh state unable to take up much moisture, but the mass formed by decomposed ferns is quite as able as decomposed straw to take up and retain moisture. When used in cattle-boxes, the fern rots more readily than in ordinary byres ; it is used chiefly in the large open "crawls" in which buffaloes and hill cattle are confined at night. It is the practice with many Planters to erect these cattle-crawls at convenient distances from their estates, and to induce the hill people, by the payment of a small sum, to confine their cattle within them at night. These "crawls" are kept liberally bedded with ferns, grass, &c., which, under the treading of the cattle at night, aided by frequent rain, become broken up and worked into a black-colored mass ; this is a convenient and expeditious way of working up ferns, &c., into a form convenient for use as manure ; but I greatly doubt the wisdom of the practice, as, not only must there be a great loss of soluble fertilizing matters by the frequent washing by rain to which the manure is exposed, especially during the later stages of decay, but owing to the enormous absorption of rain-water by the manure, the cost of conveying it to the coffee trees will be, at the least, twice as great as it should be.

125. The following is an average analysis of the composition of the ash of the bracken made by Professor Emil Wolff of the Royal Academy of Agriculture at Hohenheim, Wirtemberg ; and also, for comparison, an average analysis of wheat-straw by the same eminent chemist :—

	Bracken.	Wheat Straw.
Per cent of Ash	7·01.	4·95.
Composition of the ash—		
Potash	42·8	11·5
Soda	4·5	2·9
Magnesia	7·7	2.6
Lime	14·0	6·2
Phosphoric acid	9·7	5·4
Sulphuric acid	5·1	2·9
Silica	6·0	68·3
Chlorine	10·2	——
Total ...	100·	99·8

It will be observed in comparing these analyses that not only does the fern yield a much larger quantity of ash than wheat-straw, but that more than one-half of this ash consists of the highly valuable fertilizing minerals, phosphoric acid and potash, both so essential in a soil on which coffee trees are growing. It will be further observed that the ash of the fern is twice as rich in lime as the ash of the wheat-straw. Of course, there is always a considerable difference in the composition of the ash of the same plant produced on different soils, or under different conditions as regards cultivation and manure. However, as the fern is generally found growing on uncultivated land, the composition of its ash is somewhat more uniform than that of the ash of cultivated plants, and I think, for all practical purposes, the analysis I have given may be accepted—until we are in possession of an actual analysis of our hill-produced ferns—as fairly approximating to the analysis of the ferns used by planters in the way I have described. The percentage of lime may be on the average somewhat less, but I do not think that there would be any appreciable difference in the percentage of the other constituents of the ash.

126. *Lime.*—As far as I have been able to ascertain, lime is not used as a manure in any part of Southern India ; our Cultivators appear to be entirely ignorant of its fertilizing qualities. Seeing how universally the value of lime, as a manure, is acknowledged by Agriculturists in almost every other part of the world, it is but little to the credit of Indian Cultivators that they should have remained so long in ignorance regarding a manure which enters so largely into the food of all cultivated plants. It is true that in many localities in this Presidency, the price that must be paid for lime is twice as great as the average cost of lime to the British Farmer ; but the neglect with which lime has been treated by our Cultivators is certainly not due to its costliness, for in districts where it can be obtained more readily and at less expense, its use as a manure is equally neglected. The various experiments made on the Sydapet Farms in the use of lime as a manure have proved conclusively its value, especially for such crops as indigo, cotton, maize, tobacco, &c. But the light soils of the Sydapet Farms are not so well adapted for exhibiting the benefits derived from a dressing of lime as soils which contain a larger proportion of clay and vegetable matter. There are soils on these Farms peculiarly suited to benefit from an application of lime, but full advantage could not be derived from such a dressing until, by sub-soil draining, they have been rendered less swampy than they now are at certain seasons. I have used dressings of, from 10 cwts. to 20 cwts. per acre, spread broadcast over the soil, and I find that not only does the lime supply the peculiar food needed by our principal field crops, but it tends to render our light soils more compact, and makes them more capable to withstand the ill-effects of a long drought. The high price of lime at Sydapet prohibits its use in such dressings as in England are usually applied at one time ; but even if lime was procurable on more reasonable terms for the Sydapet Farms, it would not, I think, be advisable to apply it in heavy dressings to the light soils, of which they chiefly consist ; with such soils, it is I think best to apply light dressings of, say, 20 cwts. per acre at intervals of three or four years, instead of, as is usual in England, applying from 6 to 9 tons in one application at intervals of about fifteen years.

127. Lime forms the chief constituent of the ash of most plants cultivated in the field. All fertile soils contain a greater or less quantity of lime. Not only does lime afford the food needed by our crops, but by its action in the soil it sets free mineral food which was previously inert and of no use to growing crops. Lime, when applied to a soil, has other valuable properties in addition to those already noticed; it removes the acidity of a sour soil; it hastens the decomposition of animal and vegetable substances ; as a dressing for heavy clay or recently exposed soil, it is invaluable in its mellowing influences ; and, when applied to soils on which fruit trees are growing, it has a wonderful effect for good on the quality and flavor of their produce. A piece of ground of stiff tenacious clay, on the Experimental Farm on which the plantain trees yielded a coarse fruit, almost uneatable, was dressed with lime, after which there was a remarkable change in the quality of the fruit, not only was the flavor all that could be desired, but the skin, which before was coarse and woody, became very thin and fine, and separated easily from the edible portion.

128. It is perhaps as well, all things considered, that our Ryots should have been so ignorant regarding the action of lime on the soil; while lime in the hands of an intelligent Farmer is one of the most valuable manures that can be used, it is very unsafe in the hands of ignorant improvident Cultivators, as by its aid they are able to exhaust a soil very rapidly of its fertilizing ingredients. Soils which may for a long period continue to yield crops such as our Ryots now produce would, if deeply ploughed and dressed with lime, without the aid of other manure, yield very much larger returns, for a time, but the after effects would be that the soil would become less and less productive: the increased return produced by the lime, in addition to its own direct supply of food, being due to its action on the mineral constituents of the soil which were before either entirely inert, or only sufficiently active to supply the wants of the small crops previously produced. Of course, the object of the Farmer is to keep the mineral food in his soil in as active a state as possible. In good farming, the practice is to turn over this food, frequently and rapidly, by producing large crops in quick succession, but to enable this to be done, manure of the right quality and in proper quantities must be used freely in addition to lime, it is rather as a manure for use under high farming that lime is to be recommended to the Farmer; and while it is to be regretted that the conditions met with in the practice of agriculture in this country are not yet such as to render it advisable that our Ryots should be encouraged to use lime freely, the time is, I hope, not far distant when it may be safely recommended to their notice.

Sub-soil draining.

129. My remarks in a former report on sub-soil draining have, in some instances, been misunderstood, evidently from a want of knowledge of what sub-soil draining really means. When making those observations I thought it unnecessary to describe in detail the way in which pipe-drains act, seeing that so much has been written on the subject. It has been contended by some that, if water is so essential for the proper growth and development of field crops in Southern India, that it will be exceedingly unwise to attempt to lessen the quantity of this element in our soils. It must be remembered that no description of sub-soil drains can remove from a soil the whole of the moisture it contains, there is always even in the most perfectly drained land a considerable quantity of water which no drainage can remove. It has been found again and again that a well-drained soil contains during a drought more moisture than an undrained soil of similar character and composition; there are many reasons why this is so; drainage facilitates the working of a soil by field implements, not only in the greater perfection of the work done, but in affording a longer season in which to do the work under favorable conditions, and as a thoroughly-tilled soil is always well pulverised and therefore more porous, its capabilities to retain water by suspension are greatly increased, as well as its abilities to absorb moisture from the air. A proper seed-bed cannot be obtained in a soil in which there is too much water; for the germination of seed and the healthy growth of plants, atmospheric air must be present in the soil, and this cannot be there in a sufficient quantity when the soil is full of water. Further, a water-logged soil is always cold, not only on account of the great reduction of temperature caused by the evaporation of its water, but also because heat cannot penetrate into it. Tropical plants suffer very much when the temperature of the soil on which they are growing becomes too greatly reduced. During the prevalence of the north-east monsoon in this district, when we have had a succession of wet days with a clouded sky, I have frequently observed crops turn sickly and yellow, which previously were very healthy in appearance; and such crops seldom did well after their growth was checked in this way, as they were generally afterwards attacked by the fungoid disease "rust." I have not yet had an opportunity to make any experiments regarding the temperature of the soil at such times, but I believe that the check in growth is due almost entirely to the low temperature of the soil, as the crops growing on the drained land remained green and healthy.

130. There are, of course, soils that do not require to be artificially drained, being sufficiently well drained naturally; I only advocate the removal by sub-soil drainage, of water the land will not hold in suspension, or the water of springs immediately under cultivated land.

131. Soils differ greatly in their capacity to hold water in mechanical suspension; thus it has been found that —

100 lbs. of quartz-sand	will absorb	25 lbs. of	water.
,, of calcareous sand	do.	29 lbs. of	do.
,, of loamy soil	do.	40 lbs. of	do.
,, of English chalk	do.	45 lbs. of	do.
,, of clay loam	do.	50 lbs. of	do.
,, of pure clay	do.	70 lbs. of	do.

132. The pipes used in sub-soil draining should be placed for carrying off surplus water at a depth sufficiently great to allow of the upper soil forming a hugh filter bed, to which the rain water in passing through would give up the fertilizing matter and air it holds. Messrs. Laws and Gilbert, the eminent chemists, have found in England that in a rain-fall of thirty inches in one year, the rain-water that fell on an acre of land carried down with it as much as 7 lbs. of ammonia, which is equal to the quantity contained in a dressing of manure frequently thought sufficient for the wants of one crop.

133. In a hot country such as this, sub-soil ploughing and other deep cultivation are absolutely necessary in order to secure the full benefits that result from sub-soil draining. A soil that is simply drained, the particles of which are not separated and loosened under the influences of deep cultivation, cannot in a dry season be expected to take up more moisture from the atmosphere, than undrained land of the same kind in a similar mechanical state. The absorption of moisture from the air can only occur in porous soils into which the air can pass freely ; sun-dried, hard, compact soils are quite incapable of absorbing moisture from the air. As in this country, at night, the air near the surface of the ground is at certain seasons so heavily charged with moisture, it is especially necessary, in order to secure this moisture, that our soils should be kept as open and as porous as possible.

Implements and Machines.

134. The following new implements and machines were imported from the United States during the past year ;—

135. *Cast-Iron Plough.*—This is a small plough to be drawn by a single horse or mule, and is intended for use in cotton culture. The working parts of the plough are made of cast-iron, and its stilts and beam of wood. The cash price in New York was 3 dollars 38 cents, and its cost delivered at the Sydapet Experimental Farm was only 10 Rupees. The plough is unfortunately faulty in construction ; its mould-board is set nearly at right angles to the beam, thus causing the draught to be very heavy; and the slade is so short, the plough moves very unevenly through the soil, in places going so deeply that it becomes embedded and fixed ; by placing a wheel under the beam the latter drawback would no longer be experienced, and a slight alteration in the position of the mould-board would greatly reduce the draught. The cast-iron working-parts, also, are objectionable ; they are so liable to be broken when in use by coming into contact with stones or the roots of trees. Implements that are fitted with working-parts made of cast-iron are not yet suited for general use in this country ; much annoyance and loss have already been experienced from the purchase of such implements.

136. A plough of the kind under notice could readily be made with wrought-iron working parts and with a wheel, but the cost would be 50 per cent. greater than the price of the unimproved plough.

137. The following shows the results of an experiment made with this plough :—

Weight of Plough.	Draught registered.	Work done.		
		Depth of Furrow.	Width of Furrow.	Earth removed in 100 yards length of Furrow.
Pounds.	Pounds.	Inches.	Inches.	Cubic yards.
34	448	9·00	13·53	9·39

The soil had been recently stirred and was free and open. Nine and-a-third cubic yards for every one hundred yards of furrow is about double the amount of work usually performed by our ploughs, and is, I think, beyond the strength of the plough when in regular work, while the draught required to do so much work is too great for an ordinary pair of cattle.

138. *Steel Plough.*—This plough is similar in general apparance to that, to which I have just referred, but differs from it in having a steel mould-board with polished cast-iron share and land side, while its mould-board is less abrupt. The cash price of this plough in New York was 6 dollars and 30 cents, and its cost delivered at the Sydapet Experimental Farm was Rupees 18. The following is the result of an experiment made with this plough :—

Weight of Plough.	Draught registered.	Work done.		
		Depth of Furrow.	Width of Furrow.	Earth removed in 100 Yards' Length of Furrow.
Pounds.	Pounds.	Inches.	Inches.	Cubic Yards.
45	280	7·	11·	5·94

This experiment was made at the same time as that previously noticed and under similar conditions ; it will be observed that for the draught absorbed the result was better than that obtained with the cast-iron plough. The plough under notice possesses, though in a lesser degree, most of the faults to which I alluded when referring to the cast-iron plough. Steel mould-boards are considered to be much more durable than those that are made of cast iron, while, as the soil adheres less readily to polished steel, the draught of ploughs fitted with these mould-boards is lighter than that of ploughs fitted with ordinary mould-boards.

139. *Maize Sheller.*—Specimens of three kinds of maize shellers were obtained : single-wheel sheller, double-wheel sheller, and eagle sheller. The first and second differ only in the number of wheels each has ; they are intended for ordinary light work with manual power. The eagle sheller is a stronger and larger description well suited for continuous and heavy work. The single-wheel sheller cost in New York 9 dollars and 90 cents, and delivered at the Experimental Farm Rupees 27 ; the double wheel sheller cost delivered each Rupees 3 more. The cost of the eagle sheller delivered at the Sydapet Experimental Farm was Rupees 40 ; its price in New York was 14 dollars and 40 cents. These are all very useful machines ; each of them is capable of doing a large amount of work, and at a cost far below that usually incurred in this country for shelling maize.

140. *Winnowing Machine.*—This is a very handy little machine, and is well suited for the use of Ryots having more than 30 acres of arable land. Its cost delivered at the Experimental Farm was only Rupees 45.

141. *Chaff Cutters.*—Two specimens of the variety known as the national feed-cutter were obtained. Their knives are fixed obliquely on a cylinder ; they cut with great rapidity the thick stalks of maize, cholum, &c., as well as the finer grasses. The cost of these machines delivered at the Experimental Farm was Rupees 45 each. They are greatly superior in every way to machines fitted with ordinary vertical cutting knives, and their cost is not greater.

MODEL FARM.

142. In my last annual report I stated in detail the circumstances under which this farm was begun ; it is therefore unnecessary here to do more than mention that the land, when appropriated for the purposes of this farm, was in a most wretched condition, having been completely ruined, and then abandoned, by the Native Cultivators in whose hands it had been. The close proximity of land in this wretched state to the Experimental Farm was considered very objectionable, and the Committee, who at that time had control over the farm, thought, and I thought the same, that, if the land was taken up and worked as a Model Farm, it might be improved in appearance and in value, and a fair return be obtained on the outlay. The results of the experiment so far amply justify the opinions then formed, as far as relates to an improvement in the appearance and value of the land, but I am now convinced that it was *a mistake to begin*

an experiment to test the financial results of improved farming on land so much out of order as that taken up. It is a very different affair to open up a farm on fresh land, or land that has been fairly cultivated, than it is to establish a farm, and to work it on a good system, on a piece of worn-out land with a surface excavated and broken up in all directions.

143. The condition of the soil as regards productiveness proved to be very much lower than had been anticipated. There were a few small plots scattered over the farm on which trees had been growing that produced moderately good crops; but over fully two-thirds of the area the soils did not on the average produce 5 bushels of grain per acre and some of the land did not yield even half this quantity, while the broken surface rendered it impossible to work improved implements with any chance of success.

144. During the first two or three years after the farm was started, the surface of the land was restored to something like its natural state, but my time was then so fully occupied, and, having no one available to superintend the work, I was unwilling to expend more money in levelling the land than was absolutely necessary to admit of the proper working of improved implements and machines, but this limited improvement was altogether insufficient to secure a return that we had a right to expect from the greater care devoted to the cultivation of the land. When we succeeded in bringing a crop to maturity under satisfactory conditions, the result was very encouraging, but from their unfrequency these better crops contributed but little to the general income of the farm. The crops generally continued to be almost as precarious as when the land was first taken up. From the effects of floods and droughts not more than one sowing in every four or, five reached maturity. The interest and other charges on the cost of these *partial* improvements formed a heavy and accumulating burden against the farm without, as just noticed, producing any results of a corresponding value.

145. I was not long in forming the opinion that, before we could hope to secure satisfactory financial results from farming the land on a moderately good system of husbandry, it was necessary to complete fully, and with as little delay as possible, the improvements contemplated, for, though the immediate expense would be great, it would perhaps not be greater than if the improvements were effected gradually. Accordingly in the beginning of the last official year, the services of an Assistant being then avaliable, and the showery weather enabling earthwork to be done at a very moderate cost, I engaged a large gang of laborers and pushed forward with vigor the work needed to be done in levelling the land; this was continued throughout the summer months and until the commencement of the north-east monsoon. The work, of course, interfered greatly with the cropping of the farm and seriously lessened the income of the year, but the diminished income of the farm is far more than counterbalanced by the increased value of the estate for, the weather continuing showery throughout the whole period, the improvements were effected at a very moderate cost.

146. The surface of the land is now almost all that could be desired; heavy rains, which previously cut up and rutted the sandy soils and carried off the manure which had been applied, now do but very little damage, a greater portion of the water passing into the soil and that unabsorbed running away into surface drains. This general improvement in the lay of the land, with the provision of surface drains, has done much to prevent the accumulation of stagnant water especially in the irrigated land, but the portion of this and of the dry land liable to be submerged during floods of the river Adyar needs further attention, probably subsoil drainage will be necessary in order that the land when saturated after the floods may be speedily relieved of stagnant water. Unfortunately the portion of the farm thus circumstanced is the best part, and, as the floods generally occur in October or the beginning of November, little can be done in cropping the land until the beginning of December, when the floods are over, and in three years out of every four cereal crops sown so late never reach full maturity unless occasionally irrigated, and water is available only for a few acres of this land and frequently only up to the end of February, when the late-sown crop is but two-thirds grown.

147. But, before good results can be regularly secured from the working of this farm on a moderately good method, it is necessary, not only to lessen the ill-effects of the floods of the Adyar, but it *is absolutely needful that a plentiful and certain supply of irrigation water should be secured over the greater portion of its surface*. Under present circumstances the area that can be watered is very small, and the supply of water seldom lasts more than four months, generally ceasing just when it is most urgently needed to bring the crops to maturity.

148. A small tank, the water of which enabled the crops to be sown on a considerable area of the wet land somewhat earlier than would have been possible if the ordinary irrigation source was relied on, and which proved of great use in maturing crops after the irrigation source had failed, was last year taken from the farm and given over to the charge of another department, and, the loss caused thereby last year was great, as a large area of paddy on the ground that was flooded in the early part of the season by the river altogether failed from there being no water to bring it to maturity ; had the farm had the use of the tank as in former years, this loss would not have occurred.

149. Good farming demands that means must be at command to lessen the ill effects of droughts and floods, and that the work of the farm must progress with some degree of uniformity throughout the year. In the case of this farm, as already pointed out, the crops suffer both from droughts and from floods; and, from the absence of a continuous supply of irrigation water, the real work of the farm is limited to a period of not more than five months in the year. This, in the case of a Ryot would have mattered but little, as, during the inactive period, he would entirely suspend all expenditure and leave his draught cattle to exist on such scanty food as they could collect on the road sides and other waste places. But such a course could not be followed on a Public Farm, which must be kept in good order, under any circumstances, throughout the year. The outlay on this farm during this inactive period last year amounted to not less than Rupees 1,500, which was practically unremunerative expenditure and which should not fairly be debited in an experiment of a *commercial* nature. Hence the necessity of the farm being provided with water to enable its cultivation to be conducted throughout the year, and in this way, while keeping up its condition, produce a remunerative result on the labor thus expended. But the fact is, a Public Farm never can be conducted on *strictly commercial principles* ; there is always, even on farms in good cultivation, a large amount of work of a semi-ornamental kind to be done, which produces no direct return, and the amount of this description of work on a farm in the course of formation is necessarily greater.

150. The balance sheet on the 31st March 1875 was as follows :—

Liabilities.

	RS.	A.	P.
Loan from General Funds for 1870-71	2,776	9	10
Do. do. 1871-72	1,310	3	11
Do. do. 1872-73	1,772	2	2
Do. do. 1873-74	1,522	13	8
Do. do. 1874-75	3,082	9	8
Laborers' pay due for March 1875	187	1	5
Outstanding bill	31	7	6
Total ...	10,683	0	2

Assets.

Cattle.						
15 Working cattle...	900	0	0			
Sheep.						
15 Rams, 29 Ewes, 6 Wethers, 15 Lambs	320	0	0			
Poultry	60	0	0			
				1,280	0	0

				RS.	A.	P.
Implements.						
Implements, tools, carts, &c., as catalogued				861	8	10
Manures.						
Manure of sorts	45	0	0			
¼ Cost of manure purchased in 1873-74	10	5	11			
¼ Cost of cake purchased in 1873-74	132	15	9			
½ Cost of manure purchased in 1874-75	231	3	0			
½ Cost of cake purchased in 1874-75	268	14	7			
				688	7	3
Fruit and Fuel Trees, &c.						
Cocoanut and mango trees, Casuarina trees, Guava trees				1,350	0	0
Fruit crops				450	0	0
Field Crops.						
Grain and pulse crops, Guinea grass, Fodder crops of sorts				400	0	0
Seeds, &c., in Granary.						
175 Pounds of Carolina paddy	5	13	4			
775 Do. sumba paddy	15	8	0			
7 Do. green gram	0	5	1			
15 Do. horse gram	0	6	4			
27 Do. yellow cholum	0	10	10			
521 Do. cumboo	26	0	10			
87 Do. maize	4	5	7			
10½ Do. indigo seed	1	0	0			
22½ Do. wool	3	8	3			
27 Do. cotton in seed	2	4	0			
				59	14	3
Sundries				60	0	0
Cultivations done for next season's crop				75	0	0
* Uncollected bills				481	3	0
Difference, being balance against the farm				4,976	14	10
Total ...				10,683	0	2

151. The following are the details of Income and Expenditure during the past year :—

Expenditure.

	RS.	A.	P.
Rent and interest	913	1	6
Overseer's salary	647	8	0
Labor	1,589	12	4
Cattle	25	0	0
Pigs	168	14	10
Sheep	135	2	0
Poultry, rabbits, &c.	4	12	6
Implements, machines, and tools	334	1	4
Seeds	182	10	1
Cattle food	537	13	2
Manure	462	6	0
Sundries	56	3	7
Total ...	5,057	5	4

* Consists chiefly of debts due by the Estate.

Income.

	RS.	A.	P.
Advance from General Funds	3,082	9	8
Cattle	85	0	0
Pigs	344	0	11
Sheep	132	3	5
Poultry, rabbits, &c.	84	1	0
Fruits, plantain, and vegetables...	568	2	11
Grains, fodder, &c.	408	3	7
Indigo, cotton, and sundries	352	15	10
Total ...	5,057	5	4

Expenditure from commencement of the Farm up to and including the 31st of March 1875.

Items.	*1870-71.			1871-72.			1872-73.			1873-74.			1874-75.			Total.					
	RS.	A.	P.	RS.	A.	P.	RS.	A.	P.	RS.	A.	P.	RS.	A.	P.	RS.	A.	P.	RS.	A.	P.
Cooly labor...	1,105	4	2	1,375	9	11	1,369	14	0	1,317	1	11	1,589	12	4	6,757	10	4			
Manure	3	0	0	71	1	4	185	2	7	41	7	7	462	6	0	763	1	6			
Live stock	1,641	15	0	731	6	8	636	3	0	252	10	3	333	13	4	3,596	0	3			
Food for live stock	267	11	9	557	7	3	506	3	11	531	15	1	537	13	2	2,401	3	2			
Seeds, trees, &c.	194	1	7	91	6	7	153	9	2	122	13	5	182	10	1	744	8	10			
Implements, tools, &c.	461	9	0	18	13	0	277	8	6	67	5	0	334	1	4	1,159	4	10			
Contingencies	74	4	9	100	2	3	16	6	9	16	10	2	56	3	7	263	11	6	15,685	8	5
Overseer's salary	113	12	0	370	0	0	600	0	0	610	0	0	647	8	0	2,341	4	0			
Rent	192	8	0	385	0	0	385	0	0	385	0	0	385	0	0	1,732	8	0			
Interest on capital employed in working the farm...	69	8	4	150	0	0	200	0	0	200	0	0	200	0	0	819	8	4			
Interest on capital expended on improvements of a permanent character	94	6	7	296	1	8	328	1	6	328	1	6	328	1	6	1,374	12	9			
																			6,268	1	1
																Total...			21,953	9	6
																Unpaid bills...			218	8	11
																Total...			22,172	2	5

* Half-year.

Income from commencement of the Farm up to and including the 31st of March 1875.

Items.	*1870-71.			1871-72.			1872-73.			1873-74.			1874-75.			Total.		
	RS.	A.	P.	RS.	A.	P.	RS.	A.	P.	RS.	A.	P.	RS.	A.	P.	RS.	A.	P.
Cattle	403	1	9	560	14	9	371	15	0	419	7	5	85	0	0	1,840	6	11
Sheep	...	...	...	141	10	6	237	2	6	188	10	9	132	3	5	699	11	2
Pigs	...	...	...	263	14	0	664	5	9	390	11	6	344	0	11	1,663	0	2
Poultry, rabbits, &c.	12	6	0	97	8	0	203	4	0	65	2	10	84	1	0	462	5	10
Fruits, plantain, and vegetables, &c....	474	12	6	582	10	3	444	1	6	290	1	11	568	2	11	2,359	13	1
Hay, green fodder, &c...	42	8	0	256	6	0	484	13	6	238	11	3	150	1	10	1,172	8	7
Grains	407	0	10	705	9	3	178	11	2	411	5	7	258	1	9	1,960	12	7
Indigo and cotton	...	...	...	...	...	...	...	...	...	232	12	6	7	8	0	240	4	6
Sundries	101	10	3	228	4	0	301	9	10	113	3	6	345	7	10	1,090	3	5
Total...	1,441	7	4	2,836	12	9	2,885	15	3	2,350	3	3	1,974	11	8	11,489	2	3
Add the valuation of the assets on the 31st of March 1875																5,706	1	4
															Total...	17,195	3	7

* Half-year.

152. The actual results of the experiment are not fully brought out in the financial statements just given, much of the balance standing against the farm being for expenditure incurred for work which, though not exactly estate work, was fairly debitable against the estate, not being directly remunerative to the farm, though necessary for its successful working and to enable it to pay rent. Besides this the whole time of the Farm Overseer, who carried on the estate improvements, is debited against the farm, and there are other items which might be credited to the farm, such as up-keep of roads used by visitors, the value of the tank, the charge of which was taken from the farm last year, and given over to the charge of the Collector of Chingleput, for the use of his office establishment, &c.

153. All things considered, it would perhaps be the fairest way of now dealing with the experiment to consider the balance against the farm as expenditure on behalf of the landlord to be dealt with as with other expenditure on permanent improvements, to push on energetically to completion the whole of the contemplated improvements, and at the end of the present year, if these improvements are then completed and the farm amply supplied with irrigation water, to have the whole of its soils valued by the Settlement Department, the rent thus fixed to be the ultimate rent of the farm *without any other charge.* It might be that the rent fixed by the Settlement Department would represent but a small percentage on the total capital sunk on permanent improvements, but it must be remembered that expenditure incurred in bringing back into cultivation a worn-out exhausted arable soil is seldom directly remunerative.

IMPLEMENT WORKSHOPS.

154. The income of these workshops during the past year amounted to Rupees 2,243-11-9 and the expenditure on their behalf was Rupees 2,120-12-0.

155. There was a balance against the workshops at the end of the official year 1873-74, amounting to Rupees 540-0-4, which at the close of the year under review had been reduced to Rupees 424-15-8.

156. These workshops supplied during the year thirteen combined ploughs, seven iron ploughs, three maize shellers, one chaff cutter, one drag harrow, and a number of smaller implements and tools besides doing all the repairs needed by the implements, machines, &c., used on the Sydapet Farms. The following shows where these implements, &c., were sent :—

Province or District.	Combined Ploughs.	Iron Ploughs.	Maize Shellers.	Chaff Cutters.	Drag Harrow.
Burmah	1	...	...	...	...
Cochin	...	1	...	...	...
Coimbatore	...	2	...	1	...
Madras	2	1	...	...	1
North-Western Provinces..	7	...	...	...	...
Nilgiris	2	1	...	...	...
Port Blair...	...	...	3	...	...
Travancore	1	1	...	...	...
Trichinopoly	...	1	...	...	...
Total ...	13	7	3	1	1

157. At the close of the year there remained several registered applications for machines and implements.

The following are the details of income and expenditure during the past year :—

Income.

	RS.	A.	P.
Machines, &c.	792	4	6
Labor, materials, &c.	1,451	7	3
Total ...	2,243	11	9

Expenditure.

	RS.	A.	P.
Buildings	9	15	0
Plant	23	10	0
Cooly labor, &c.	1,025	4	3
Materials, &c.	931	14	9
Interest on capital	130	0	0
Total ...	2,120	12	0

Implement Workshops' Balance Sheet on the 31st March 1875—

Liabilities.

				RS.	A.	P.
Loan from General Funds for 1870-71				883	1	5
Do. do. 1871-72				213	1	2
Do. do. 1872-73				1,077	3	2
Outstanding bills				142	2	0
Laborers' pay due for March 1875				94	10	0
				2,410	1	9
Deduct capital returned by excess of income over expenditure during 1873-74	213	10	5			
Deduct capital returned by excess of income over expenditure during 1874-75	122	15	9			
				336	10	2
Total ...				2,073	7	7

Assets.

	RS.	A.	P.
Buildings	419	15	3
Plant	321	1	6
Materials	251	12	2
New implements, machines, &c., in stock	352	0	0
*Outstanding bills...	303	11	0
Deficiency	424	15	8
Total ...	2,073	7	7

Establishment.

158. I have received much valuable aid from my Assistants Mr. Charles Benson, M.R.A.C., and Mr. Kaspar Schiffmayer. During my absence from duty for three months last year on privilege leave Mr. Benson had charge of my office, and Mr. Schiffmayer had charge of the working of the Sydapet Farms. There is nothing in the conduct of the Overseers, Clerks, or Apprentices that needs special notice here; all have performed their respective duties in a satisfactory way.

SYDAPET,
11th September 1875.

(Signed) W. R. ROBERTSON, M.R.A.C.,
Superintendent of Government Farms.

* Since collected.

APPENDICES.

Rain-fall registered at the Experimental Farm during the year ending 31st March 1875.

Day	April 1874.	May 1874.	June 1874.	July 1874.	August 1874.	September 1874.	October 1874.	November 1874.	December 1874.	January 1875.	February 1875.	March 1875.
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
1	...	...	...	...	...	2·55	...	...	...	...	...	0·77
2	...	...	...	...	...	0·34	...	...	...	...	...	...
3	...	...	1·60	...	...	0·47	...	...	...	...	...	...
4	...	...	0·63	...	...	...	...	...	...	...	...	...
5	...	5·80	...	...	...	0·53	1·15	...	...	...	...	...
6	...	0·71	...	0·84	0·45	0·54	...	0·40	...	...	...	...
7	...	...	...	...	...	0·53	...	...	...	...	...	...
8	...	...	2·45	...	...	...	...	...	...	...	...	...
9	...	...	0·25	0·82	...	...	...	1·00	...	...	...	...
10	...	...	...	...	0·29	2·38	...	...	...	...	...	...
11	...	...	...	0·62	0·25	...	...	...	0·77	...	...	...
12	...	...	...	...	...	...	...	...	2·30	...	...	...
13	...	...	...	0·14	...	...	...	...	...	...	...	...
14	...	...	...	...	...	0·44	...	...	1·50	...	...	...
15	...	...	0·42	...	...	...	...	...	0·44	...	...	...
16	...	...	...	...	...	...	2·99	...	...	...	...	...
17	...	...	...	0·33	...	...	...	0·10	...	...	...	...
18	...	...	...	1·78	1·10	0·50	...	0·25	...	...	...	...
19	...	...	...	0·15	...	...	0·24	...	...	...	...	...
20	...	...	...	...	0·25	...	...	...	...	...	...	...
21	...	...	...	...	...	...	0·83	...	...	...	...	...
22	...	...	...	...	...	...	1·09	...	...	...	...	...
23	...	...	...	...	...	0·43	2·86	...	...	...	...	...
24	...	...	...	...	...	...	7·67	...	...	...	...	...
25	...	...	...	...	...	...	3·41	...	...	0·10	...	...
26	...	0·28	...	...	...	...	1·39	1·06	...	...	...	...
27	...	...	0·22	...	...	...	0·28	3·06	...	...	...	...
28	...	...	...	0·78	...	0·69	...	...	0·10	...	...	...
29	...	...	1·09	...	...	1·19	...	...	...	...	...	...
30	...	...	...	...	...	...	...	3·38	...	...	...	...
31		...		...	...		...		...	...		...
Total	Total...None.	Total.6·79	Total.6·66	Total.5·46	Total ...2·34	Total...10·59	Total...21·91	Total... 9·25	Total... 5·11	Total...0·10	Total None.	Total 0·77

Expenditure on account of the Madras Agricultural Department.

	RS.	A.	P.	RS.	A.	P.
I. *General Supervision.*						
Establishment *	16,872	1	5			
Travelling allowance	1,048	4	5			
Contingencies	270	3	2			
				18,190	9	0
II. *Madras Experimental Farm.*						
Establishment	989	10	11			
Cooly labor	3,000	12	11			
Implements and machines	917	2	9			
Live stock	244	11	4			
Seeds	418	9	0			
Food for live stock	1,696	5	4			
Manure	380	8	1			
Despatching seeds	153	3	0			
Contingencies	355	2	8			
				8,156	2	0
III. *Madras Model Farm.*						
Establishment	647	8	0			
Cooly labor	1,589	12	4			
Manure	462	6	0			
Live stock	333	13	4			
Food for live stock	537	13	2			
Seeds	182	10	1			
Implements, carts, and water-lifts	334	1	4			
Rent and interest	913	1	6			
Contingencies	56	3	7			
				5,057	5	4
IV. *Implement Workshops.*						
Carpenters, smiths and filer	768	13	6			
Cooly labor	261	13	9			
Machines, implements, and materials	960	0	9			
Interest on capital	130	0	0			
				2,120	12	0
V. *Educational.*						
District Farm Apprentices	1,157	5	8			
Sydapet do. do.	1,353	5	10			
Schoolmaster for laborers' children	81	8	9			
Books, &c., for library	48	13	0			
Analytical laboratory	280	6	4			
Contingencies	88	8	5			
				3,010	0	0
VI. *Estate Improvements of a Permanent Character.*						
Repairs to buildings, &c.	803	5	5			
Re-thatching cattle shed at Model Farm	108	1	3			
Constructing field roads and repairs to similar roads ...	434	14	0			
Water channels	379	11	4			
Deepening wells	23	10	0			
Sub-soil and surface drainage	627	10	7			
Trees and planting	135	0	0			
Levelling and reclaiming land on the banks of the river ...	166	15	0			
Levelling the surface of dry crop land brought under wet cultivation, &c.	1,942	11	7			

* Includes salary of the Assistant to be placed in charge of the Coimbatore District Farm.

	RS. A. P.	RS. A. P.
Re-gravelling road at Model Farm	150 15 10	
Contingencies	83 3 6	
		4,856 2 6
Total ...		41,390 14 10

INCOME OF THE MADRAS AGRICULTURAL DEPARTMENT.

Balance on hand as per Accountant General's Books ...	1,75,975 14 7	
Special Grant	25,000 0 0	
Receipts from the Surplus Pound Fund during 1874-75 ...	56,756 6 9	
		2,57,732 5 4
I. *Madras Experimental Farm.*		
Fruits, vegetables, &c.	136 9 1	
Fodder, &c.	45 5 7	
Rent, &c.	1,446 11 5	
Cattle	27 4 0	
Pigs	227 2 4	
Sheep	261 4 0	
Poultry, rabbits, &c.	78 10 0	
Grains, seeds, &c.	492 6 10	
Indigo and cotton	84 11 8	
Machines, &c.	111 10 9	
Sundries	698 2 8	
		3,609 14 4
II. *Madras Model Farm.*		
Fruits, vegetables, &c.	568 2 11	
Fodder, &c.	150 1 10	
Cattle	85 0 0	
Pigs	344 0 11	
Sheep	132 3 5	
Poultry, rabbits, &c.	84 1 0	
Grains, seeds, cotton, &c.	265 9 9	
Sundries	345 7 10	
		1,974 11 8
III. *Implement Workshops.*		
Machines	792 4 6	
Materials, labor, &c.	1,451 7 3	
		2,243 11 9
Total ...		2,65,560 11 1
Balance in favor of the Madras Agricultural Department on the 1st of April 1875		2,23,405 2 3

VALUATION of Live and Dead Stock belonging to the Sydapet Experimental Farm on the 31st of March 1875.

	RS. A. P.	RS. A. P.
Cattle—		
5 Bulls		
18 Bullocks	... ...	1,485 0 0
1 Cow		
2 Calves		
Sheep—		
24 Rams		
59 Ewes	... ...	883 0 0
32 Gimmers		
53 Lambs		
Pigs—		
8 Boars		
13 Sows	... ...	429 0 0
2 Geldings		
3 Young Pigs		

	RS.	A.	P.	RS.	A.	P.
Poultry ...				60	0	0
Manures.						
Manure of sorts				200	0	0
Growing Crops.						
Gram, paddy, raggi, &c.	150	0	0			
Cotton ...	75	0	0			
Castor-oil	25	0	0			
Sugar-cane, brinjals, and plantains ...	500	0	0			
Fruit trees	60	0	0			
Casuarina and cocoanut trees	150	0	0			
				960	0	0
Farm Seeds, &c.						
1,059 pounds of Carolina paddy	35	4	10			
69 ,, of Sumba paddy	1	6	1			
569 ,, of Car paddy...	9	7	9			
23½ ,, of Burmah Car paddy	0	6	0			
355 ,, of Goondoo Sumba paddy ...	7	1	7			
511 ,, of Pegu paddy	8	8	3			
60 ,, of White Pootoo paddy	1	0	0			
172 ,, of Tenney seed	7	2	8			
87 ,, of Cumboo ...	4	5	7			
137 ,, of Green-gram	5	11	4			
13 ,, of Horse-gram	0	5	7			
68 ,, of Dholl	5	10	8			
298 ,, of Sorghum Saccharatum ...	14	14	5			
454 ,, of Yellow cholum ...	11	5	7			
38 ,, of Indigo seed	3	7	3			
452 ,, of Wheat ...	22	9	7			
414 ,, of Corakapilly seed ...	18	13	1			
114½ ,, of Cotton seed	1	14	6			
167 ,, of Jute seed	10	0	0			
11 ,, of Poppy seed	2	8	0			
17½ ,, of Mustard seed	2	0	0			
59 ,, of Sunflower seed ...	3	0	0			
42 ,, of Roselle seed	3	8	0			
219 ,, of Gingelly seed	22	8	7			
26 ,, of Linseed ...	6	14	5			
145 ,, of Castor-oil seed	6	0	8			
356 ,, of Raggi ...	8	14	3			
283 ,, of White cholum	8	9	6			
48 ,, of Dew gram	2	13	2			
15½ ,, of Fenugreek seed ...	0	15	6			
4 Bunches of plantains	1	0	0			
134½ pounds of Wool	21	0	3			
93 ,, of Cotton ...	22	5	1			
				281	8	2
Cattle Food.						
3,653 pounds of Ground-nut oil cake				49	5	0
Implements.						
Implements and tools as catalogued in Inventory ...				5,475	2	0
Total ...				9,822	15	2

Seeds supplied gratis during 1874-75.

Date.	To whom supplied.	Maize.	Cotton.	Carolina Paddy.	Yellow Cholum.	Sorghum Saccharatum.
		lbs.	lbs.	lbs.	lbs.	lbs.
12th May 1874.	R. Ragoonatha Row, Mylapore	10	4	25	10	...
15th „ ...	Doctor Shortt, Shevaroys	...	...	10	...	5
11th June ...	Jaya Row, Madura...	10	20	...	...	...
12th „ ...	C. Rajoo Moodelliar	...	...	10	...	...
„ ...	Najeemodien Saib, Sydapet	5	...	...	...	...
15th „ ...	Ramachendra Row...	10	10	10	...	10
7th July ...	K. Rungasawmy Naidu, Sydapet ...	3	3	...	...	3
„ ...	P. Valayutha Naick, Madras	5	5	5	...	5
16th „ ...	Mr. R. W. Weld, Mayaveram	5	30	15	...	5
17th „ ...	Mr. R. W. Barlow, Chingleput District...	...	...	6	...	1
24th „ ...	Doctor Cornish, Madras	2	...	...	...	3
25th „ ...	Abdoor Kuzzar	5	5	10	...	...
28th „ ...	The Coimbatore Municipality	20	10	...	...	5
31st „ ...	Mr. Mackenzie, Nellore	10	5	...	...	5
3rd Sept. ...	The Badagas, Kaity Valley	5	10	...	5	5
„ ...	Rajoo Chetty, Sydapet	...	...	$9\frac{1}{4}$	...	...
10th „ ...	Moothealoo Chetty, Sydapet	10	10	10	...	5
26th „ ...	Mr. A. D. Lister, Shevaroys	5	...	...	—	2
7th Oct. ...	Captain E. Campbell, Dindigul	10	5	...	...	...
8th „ ...	Bashyam Iyengar, Mylapore	10	10	..	10	5
„ ...	Appavoo Naick, Chingleput	15	...	15	10	...
28th „ ...	Mr. Thomas Stanes, Coonoor	...	...	...	10	10
6th Nov. ...	Ramiah Pillai, Sydapet	5	...	10	...	...
19th „ ...	Bashyam Iyengar, Mylapore	...	...	...	10	...
26th Feb. ...	The Government of Bengal	...	...	150	...	...
	Total ...	145	127	$285\frac{1}{4}$	55	69

Catalogue of Machines, Implements, Tools, &c., belonging to the Experimental Farm on the 1st *April* 1875.

1 Chaff-cutter and universal mill, with bullock power, by Messrs. Ransomes and Sims.

1 Threshing machine, with bullock power, by Emery Brothers.

1 Threshing machine, by Dray Taylor & Co.

1 Threshing machine, with bullock gear and carriage, by Ransomes and Sims.

1 Threshing machine, with bullock gear and carriage by Garret & Co.

1 Winnowing machine, by Garret & Co.

1 Winnowing machine, by Dray, Taylor & Co.

1 Winnowing machine, by Ransomes and Sims.

1 Winnowing machine, by Hornsby and Sons.

1 Winnowing machine, by Smith & Co.

3 Reaping machines, by Samuelson & Co.

1 Drill sowing machine, 8 rows, by Garret & Co.

1 Cylindrical corn screw by Ransomes and Sims.

2 Ploughs by Ames & Co., Boston.

1 Turn-wrest plough and yoke, by Ransomes and Sims.

1 Stone roller.

2 Drill sowing machines, 13 rows, by Garret & Co.

1 Wood drag harrow, by Experimental Farm

2 Iron chain harrows.

4 Bullock hoes.

1 Bullock plough, by School of Arts.

1 Bullock plough, by Mint.

2 Bullock ploughs by Ransomes and Sims.

1 Double mould board plough.

1 Large plough, with two wheels, by Ransomes and Sims.

1 Swing plough, by Roorkee Workshop.

2 Wet land ploughs, by Experimental Farm.

1 Wooden roller.

1 Four-wheel waggon.

1 Stone trolley.

1 Root-pulper, by Ransomes and Sims.

2 Sets of iron harrows, with swingletree, by Ransomes and Sims.
3 Country carts.
2 Water carts.
1 Sewage cart, by Gun Carriage Works.
1 Maize sheller, by Ransomes and Sims.
1 Drain-pipe making machine.
1 Barrow drill, by Experimental Farm.
1 Rain guage.
1 Water elevator, by Burges and Key.
1 Water elevator, by Mint.
2 Water elevators, by Experimental Farm.
3 English ladders.
1 Norton's tube well with a rotary motion.
1 English grindstone.
1 Farm bell.
2 Wheel hand-hoes.
14 Cattle yokes.
2 Single bullock carts.
1 Overhead, bullock power, with shafts and gearing.
1 Californian pump.
1 Archmedian pump.
1 Cake-crusher.
1 Two-wheel plough with cultivator, by Ransomes and Sims.
1 Pump, by Roorkee Workshop.
1 Combined mill and oil-cake breaker, by Ransomes and Sims.
1 Chain pump, manual-power.
1 Chain pump, bullock-power.
1 Large platform weighing-machine.
1 Large beam and scales.
1 Cotton gin, by Gordon & Co.
1 Cotton gin, by Donlop.
1 Cotton gin, by Platt Brothers.
1 Country cotton gin.
8 Cottage cotton gins.
2 Cotton gins, by Burges and Key.
1 Hand broad-cast sowing machine.
5 English carts.
1 Malabar spoon bale.
2 Waterproof cart covers.
1 Sack-barrow.
1 Portable scale with weights.
3 Picottah buckets.
4 Leather buckets with ropes and gearing for double mhote.
1 Large wheel-barrow.
13 Wheel-barrows.
3 Hay frames for carts.
1 Hand cart.
1 Sub-soil plough.
3 Clocks.
14 Tables.
14 Chairs.
2 Writing desks.
5 Almirahs.
2 Iron cash chests.
3 Book cases.
1 Dynanometer.
1 Surveying level with stand staves, &c.
Set of bottle levels, chemical apparatus, mortars and pestles, glass beakers, &c.
20 Feeding tubs.
5 Metal feeding troughs.
1 Scythe.
1 Manure drag.
2 Bengal picks.
2 Dutch hoes.
20 Hoes.
3 Hatchets.
2 Hand-barrows.
7 Iron rakes.
35 Mamoties.
1 Large field rake.
13 Crowbars.
16 Picks.
2 Mattocks.
5 Forks of sorts.
1 Horse hoe.
6 Shovels.
4 Bill hooks.
1 Iron real.
10 Grass knives.
4 Manure forks.
14 Digging forks.
4 Sets of bullock harness.
2 Surveying chains with pins.
2 Iron cisterns.
91 Specimen seed bottles.
2 Hedge knives.
3 Pairs of thorn pincers.
1 Ear punch for marking sheep.
1 Mercal, one half-mercal, and one measure.
1 Weeding spud.
3 Pairs of sheep shears.
1 Dibble.
6 Spanners.
5 Mallets.
5 Rammers.
2 Hedge shears.
1 Poultry feeding cage.
1 Maize cob-stand.
2 Driving wheels.
1 Large rubbish screen.
1 Drain scoop.

1 Lactometer.
1 Single barrel fowling piece.
1 Pair of pan scales.
1 Branding iron for marking sheep.
1 Theodolite.
2 Sickles.
1 Chester measure metallic tape, 66 feet.
10 Levelling boards.
1 Screening die, two pipe dies, one hollow brick die, eight brick moulds, one rake for furnace, and one poker.
1 Screw jack.
1 Hoe fork.
1 Leather bucket.
7 Wooden troughs.
1 Hand screen.
1 Cross staff.
3 Iron cots.
3 Country ploughs of different patterns.
3 Benches.
4 Large hand hoes.
1 Small hand hoe.
1 Heavy hatchet.
1 Knife.
4 Reaping knives.
2 Draining spades.
1 Country plough from Napier Foundry.
1 Country reaping knife.
1 Lantern.
1 Pruning knife.
1 Rabbit box.

Implements, Machines, Tools, &c., belonging to the Model Farm on the 1*st of April* 1875.

3 Iron ploughs.
4 Combined ploughs.
1 Set of iron harrows with swingletree.
2 Country carts.
1 Box cart.
6 Reaping hooks.
8 Picottah buckets.
1 Chopper.
20 Feeding tubs.
3 Small wheel-barrows.
6 Digging forks.
7 Yokes.
8 Planters' hoes.
1 Tub for well.
1 Scythe.
1 Weeding spud.
1 Tarpaulin.
1 Measure.
1 Half-mercal.
1 Scale triangle, weights, &c.
2 Spades.
1 Large beam and cattle-weighing scale.
9 Fifty-six pound weights.
26 Plough-shares.
1 Table.
1 Hay fork.
1 Mamoty.
1 Pair pincers.
1 Turn-screw.
1 Chisel.
1 Gimlet.
1 Triangle with beater.
1 Water cask.
1 Hand saw.
1 Hatchet.
1 Cold chisel.
2 Mallets.
1 Chaff cutter.
1 Lantern.
1 Steel.
1 Drag harrow.

List of Tools, &c., belonging to the Implement Workshops on the 1*st of April* 1875.

2 Large anvils.
1 Circular anvil.
1 Small anvil.
18 Tongs.
3 Bellows.
2 Screw plates.
4 Sledge hammers.
6 Small hammers.
6 Chisels "Smith's."
8 Punches.
1 Countersinking punch.
5 Dies or flat chisels.
2 Pairs of calipers.
1 Iron square.
2 Round files.
3 Half-round files.
2 Flat files.
22 Taps for screw plates.
1 Iron brace and 8 bits.
1 Filer's hammer.

1 Filer's cold chisel.
2 Hand vices.
7 Spanners.
1 Square file.
1 Angular file.
1 Bob drill.
2 Screw liners.
1 Bench with 2 vices.
3 Hand saws.
1 Pit saw.
1 Cross-cut saw.
5 Augers.
2 Jack planes.
1 Spoke shove.
1 Spirit level.
1 Shoeing rasp.
1 Pincer.
1 Compass.
8 Carpenters' chisels.
1 Cold chisel and 2 chisels.
2 Set squares.
1 Angle square.
3 Gimlets.
1 Brace with 36 bits.
2 Adzes.
1 Hammer.
2 Turn-screws.
1 Plummet.
4 Saw files.
4 Rasps for wood.
1 Mallet.
1 Pair scales.

List of Books added to the Apprentices' Library during 1874-75.

Catalogue of Agricultural Implements.
Indian Journal of Science.
The Principles of Chemistry, by Dr. Julius Adolph Stockhardt, 1852.
Elements of Mechanism, by Thomas Tate, 1859.
The Conchologists' Text Book, by William Maggillinray, Esq., 1853.
Natural Production of Burmah, by Rev. Francis Mason, A.M., 1850.
Elements of Chemical Analysis, Qualitative and Quantitative, by Edward Andrew Parnell, 1845.
The Physiology of Common Life, or the Science of Health, by John Scoffern, M.B, London, 1857.
Elementary Introduction in Chemical Analysis, by Dr. C. Renugins Fresenius, 1853.
A Journey from Madras through the Countries of Mysore, Canara, and Malabar, by Francis Buchanan, M.D., 3 Vols., 1807.
Humboldt's Cosmos, by Alexander Von Humboldt, 4 Vols.
Zoology for Schools, by Robert Patterson, 2 Vols., 1848.
A Manual of the Nellore District, in the Presidency of Madras, by J. A. C. Boswell, M.C.S.
Allen's Catalogue of Agricultural and Horticultural Implements.
A Catalogue—Fat Cattle.
The Journal of the Royal Agricultural Society of England, Vol. X., Part I., 1874.
Do. do. do. do. do. Vol. X., Part II., 1874.
Do. do. do. do. do. Vol. IX., Part II., 1873.
Manual of Physical Research adapted for India, by George Buist, L.L.D., &c., Part I., 1852.
A Manual of Chemistry, Inorganic and Organic, by T. Key, Esq., 1852.
The Culture of Cotton in India, by J. Forbes Royle, M.D., F.R.S., 1851.
Introductory Text Book of Meteorology, by Alexander Buchan, M.A., F.R.S.E.
Indian Postal Guide for 1874.
Asylum Press Almanac for 1874.
The Horse, by William Yonatt, 1843.
Treatise on Geology, by Professor John Phillips, F.R.S., 1838.
Our Home Islands, by Rev. Thomas Milner, M.A., F.R.G.S.
Physics, by Professor Balfour Stewart, 1872.
Mensuration for Beginners, by J. Todhunter, M.A., &c., 1871.
Foods, by Edward Smith, M.D., &c.
The Reason Why—Natural History.
Asylum Press Almanac for 1875.